Water Management Plan

2007

Westlands Water District

March 3, 2008

Westlands Water District

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Common Abbreviations

Ac	-	Acre
AF	-	Acre-Foot
AW	-	Applied Water
Bureau	-	United States Bureau of Reclamation
CC	-	Coalinga Canal
CIMIS	-	California Irrigation Management Information System
CVP	-	Central Valley Project
DU	-	Distribution Uniformity
DWR	-	California Department of Water Resources
ET	-	Evapotranspiration
EWMPs	-	Efficient Water Management Practices
IIP	-	Irrigation Improvement Program
IMIS	-	Irrigation Management Information System
IMS	-	Irrigation Management Service
kWh	-	Kilowatt Hour
LRD	-	Leaching Requirement Depth
M&I	-	Municipal and Industrial
O&M	-	Operation and Maintenance
Project	-	See CVP
RRA	-	Reclamation Reform Act
SAE	-	Seasonal Application Efficiency
SAM	-	Salinity Assessment and Monitoring
SLD	-	San Luis Drain
SLU	-	San Luis Unit
USDA	-	United States Department of Agriculture
USGS	-	United States Geological Survey
WCP	-	Water Conservation Program
WMIP	-	Water Management Information Program
WRCD	-	Westside Resource Conservation District

Summary

The mission of Westlands Water District is to provide timely, reliable and affordable water supply to its landowners and water users, and to provide drainage service to those lands that need it. To this end, Westlands is committed to the preservation of its federal contract, which includes water and drainage service, and to the acquisition of additional water necessary to meet the needs of its landowners and water users. The following objectives were adopted to support this mission:

- Preserve and restore the federal contract water supply.
- Obtain supplemental water supplies through short- and long-term purchases and transfers; support individual transfers.
- Develop a process to examine the various options available for the purposes of supply enhancement and drainage mitigation.
- Support timely construction of cost-effective facilities to enhance the quality and reliability of water supplies.
- Conduct the maintenance, operational and administrative functions of the District in an efficient and effective manner.

Water conservation was an integral part of the design of Westlandsô distribution system in the early 1960ôs. A closed pipeline distribution system and metered deliveries, prerequisites for optimum water management, enabled the District to equitably and efficiently deliver the Districtôs water supply with virtually no losses to seepage, evaporation, and spills.

In 1972, the District began to look at on-farm water management as the area where immediate conservation gains could be made. The goal then, as it is today, was to provide farmers with accurate and up-to-date information and technical assistance to help them with water management planning and decisions.

Water Conservation Program

Westlandsô current *Water Conservation Program* has evolved out of necessity and adversity into the Program that it is today, staffed by a graduate-level water management specialist and a public information person, under the direction of the Water Conservation Coordinator, a licensed engineer. The Programôs staff collects data, provides practical information to the farmers, renders technical assistance as necessary, and keeps abreast of statewide water conservation-related developments.

Westlandsô *Water Conservation Program* has surpassed the goals to meet the changing needs of its farmers under increasingly difficult water supply and drainage conditions. The Program has responded to these needs and other critical issues with farmer information and assistance programs toward the following objectives:

- Increase seasonal application efficiency.
- Increase distribution uniformity.
- Increase crop yields.
- Decrease deep percolation.
- Decrease the effects of soil salinity.

The tangible results have been a relative stabilization of shallow groundwater depths, a substantial increase in the number of pressurized (sprinklers and drip) irrigation systems, and intensified irrigation management through the use of irrigation specialists and science-based technology, and a historic average District-wide seasonal application efficiency of 83 percent.

The current *Water Conservation Program* consists of the following elements:

- The *Irrigation Guide* provides farmers with water requirements for various crops based on actual weather and computer modeling. The *Guide's* crop-water use values are verified with neutron probe sites strategically located throughout the District. A separate *Guide* for each of the Districtôs three climatic regions are mailed, emailed or faxed to farmers weekly. The *Guide* for the three climatic regions is placed on the Districtôs web page.

- *The Water Conservation and Management Handbook* (Irrigation Management Handbook) contains specific water management information for Westlandsô farming conditions. First published in 1985, it is currently undergoing a major revision.

- Workshops and meetings with small groups of farmers facilitate a two-way flow of timely water management information. Key District staff and water management experts from the private sector, academia, and government are invited to present the latest tips on water supply and management, irrigation equipment, and available resources.

- Technical assistance and Water Conservation computer programs provide farmers with one-on-one interaction on irrigation management issues. A full-time, graduate-level water management specialist is available to address farmersô technical questions and problems and assist them with the Districtôs computer programs.

- The District maintains an aggressive program for the installation, upgrading, and repair of District water meters. Water meters are required at each District delivery and on private wells participating in any of the Districtôs conjunctive use programs. They provide farmers and the District with an important water management tool.

- Groundwater monitoring provides farmers with information on the quality and depth of deep groundwater. This enables them to assess their groundwater development and use options at much lower cost than if they had to obtain the information on their own.

- Shallow groundwater monitoring provides farmers with information on the quality and depth of shallow groundwater on a District-wide basis. This gives irrigation managers another low-cost tool with which to develop their water management strategy.

- Efficiency testing is conducted on District pumps, which serve as part of the water distribution system. This can help prevent potentially catastrophic system downtime and reduce electrical consumption and costs.

- Conjunctive use of surface and groundwater improves overall water supply reliability by making more efficient use of water that is available. In wet periods, use of surface water is encouraged to preserve groundwater supplies. In droughts, greater flexibility in the use of groundwater is facilitated to extract the maximum benefit from this resource.

- Irrigation System Improvement Program lease program offers water users an opportunity to lease/own equipment such as drip, micro-spray, sprinkler, and aluminum pipe. The goal of the program is to encourage conversion to more efficient means of irrigation.

- Satellite imagery purchased approximately once every two weeks, from USGS, processed by staff and placed on the Districtôs web page. The imagery give the Districtsô farmers visual Distribution Uniformity on each of there fields.

Section 1

Historical Background

Historical Background

Westlands consists of nearly 1,000 square miles of prime farmland between the Diablo Range of the California Coast Range Mountains and the trough, or lowest point, of the San Joaquin Valley in western Fresno and Kings Counties. Westlands averages 15 miles in width and stretches 70 miles from Mendota on the north to Kettleman City on the south. Figure 1 shows the general location of Westlands. Figure 2 is a map of Westlands in the western portion of the San Joaquin Valley.

Westlands Water District includes two Distribution Districts which manage separate water contracts. In 2000 Westlands Water District Distribution District Number 1 (DD1) was formed and in 2002, Westlands Water District Distribution District Number 2 (DD2) was formed. In 2005, Broadview Water District was annexed to Westlands Water District. Figure 3 depicts DD1 and DD2.

Westlands is located in both Fresno and Kings Counties with Huron and Lemoore Naval Air Station the only communities within the District. Huronôs 2000 population was 6,306 with a population-projected increase of 31 percent by 2010. The population growth for Fresno and Kings Counties were 20 percent and 27 percent, respectively, during the period 1990 to 2000.

The loss of agricultural acreage and ultimate loss of employment would lead to population losses in specific areas of the county. With an uncertain water supply, it is difficult to determine the population trends over the short- and long-term. Neighboring communities are also greatly impacted by agriculture in Westlands for jobs and economic stability. These include the cities of Mendota, Kerman, Coalinga, and Lemoore. Decreases in agricultural acreages in Westlands would affect the projected population. Table 1 summarizes the population projections for selected communities through 2020.

Table 2 summarizes the population of the Fresno and Kings Counties for census years 1980, 1990 and 2000. The table also gives the percent of change and percent of population in unincorporated areas for the periods 1980-1990 and 1990-2000.

Table 1: Community Population Projections

	Year			
Community	1990	2000	2010	2020
Firebaugh	4,429	5,743	7,500	9,700
Huron	4,766	6,306	8,300	11,000
Mendota	6,821	7,890	9,100	10,500

Table 2: Growth of Counties and Cities
Within the San Luis Unit

1980-1990

County/City	Population 1980	Population 1990	Percent of Population Unincorporated areas 1980	Percent of Population Unincorporated areas 1990	Percent Change 1980-1990
Fresno County	514,621	667,490	37.13	23.92	29.71
Coalinga	6,593	8,212			24.56
Fresno	217,346	354,202			62.97
Firebaugh	3,740	4,429			18.42
Huron	2,768	4,766			72.18
Mendota	5,038	6,821			35.39
Others	88,047	129,424			46.49
Unincorporated	191,089	159,636			-16.46
Kings County	73,738	101,469	45.24	33.33	37.61
Avenal	4,137	9,770			136.16
Hanford	20,958	30,897			47.42
Lemoore	8,832	13,622			54.23
Others	6,454	13,364			107.07
Unincorporated	33,357	33,816			1.38

1990-2000

County/City	Population 1990	Population 2000	Percent of Population Unincorporated areas 1990	Percent of Population Unincorporated areas 2000	Percent Change 1990-2000
Fresno County	667,490	799,407	23.92	21.10	19.76
Coalinga	8,212	11,688			42.33
Fresno	354,202	427,652			20.74
Firebaugh	4,429	5,743			29.67
Huron	4,766	6,306			32.31
Mendota	6,821	7,890			15.67
Others	129,424	171,465			32.48
Unincorporated	159,636	168,663			5.65
Kings County	101,469	129,461	33.33	36.60	27.59
Avenal	9,770	14,674			50.19
Hanford	30,897	41,686			34.92
Lemoore	13,622	19,712			44.71
Others	13,364	6,002			-55.09
Unincorporated	33,816	47,387			40.13

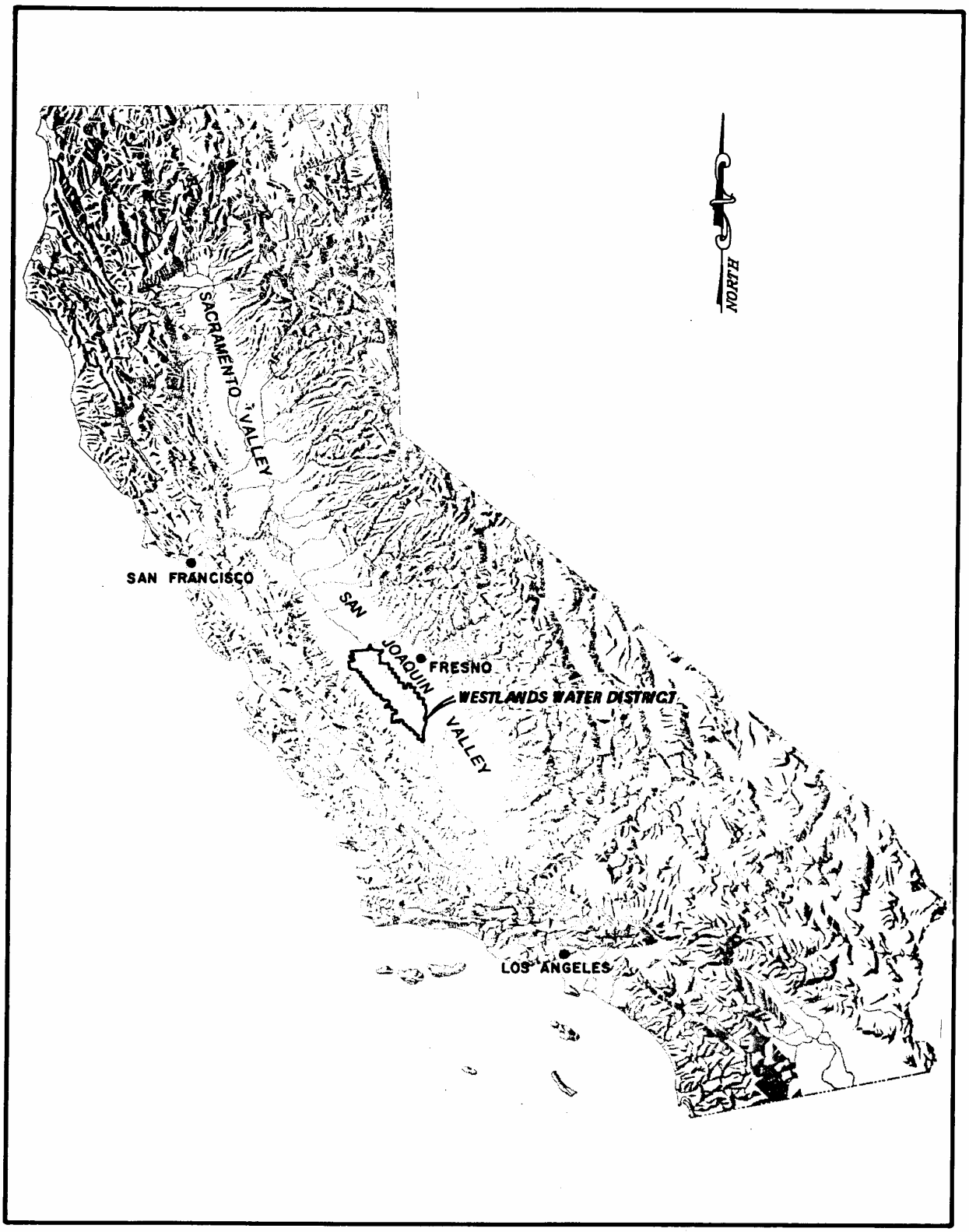

Figure 1: Location of Westlands Water District in California.

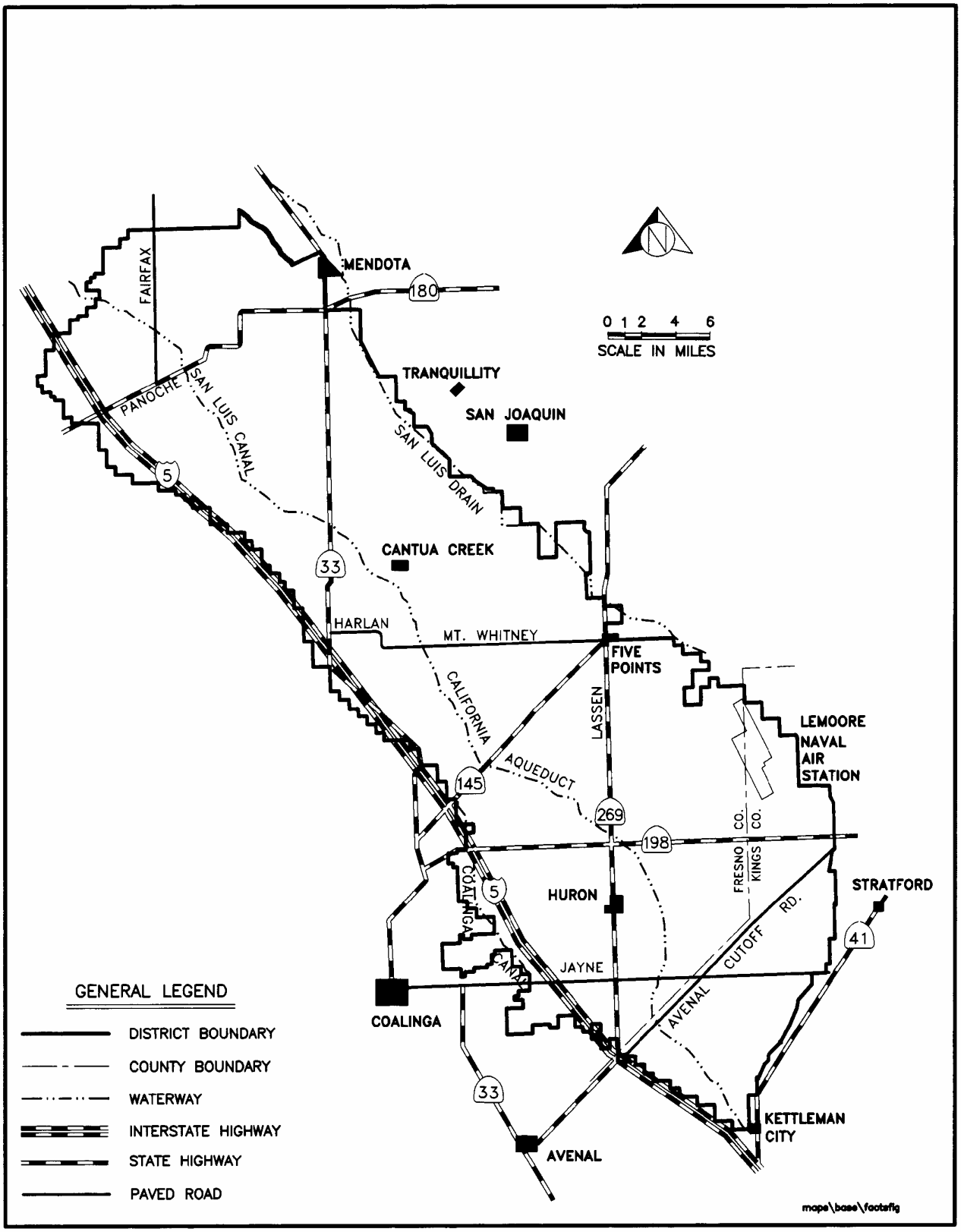

Figure 2: Westlands Water District.

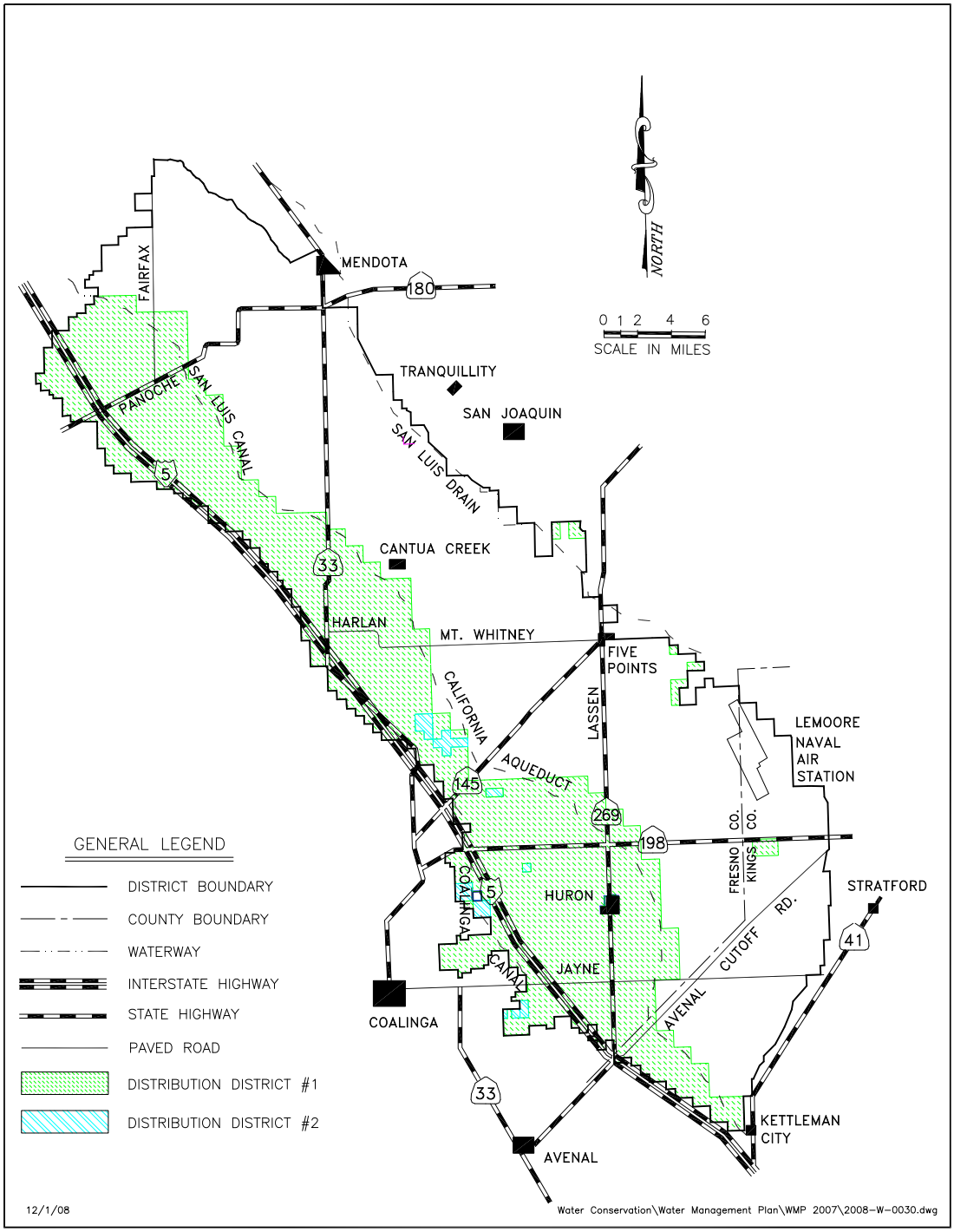

Figure 3: DD1 and DD2

District Formation

Westlands formed under California Water District Law in 1952 upon petition of landowners located within the District's proposed boundaries. Nearly all land within the current Westlandsô boundaries was at one time farmed using groundwater.

Negotiations between Westlands and the U.S. Bureau of Reclamation began on a contract to provide a dependable, supplemental supply of surface water through the Bureau's Central Valley Project (CVP) shortly after the Districtôs formation. At that time, the federal government was considering the development and construction of the CVPôs San Luis Unit (SLU). This involved cooperation between the federal and state governments with regard to shared water storage facilities and conveyance systems.

When the original Westlands was organized, it included approximately 376,000 acres. In 1965, it merged with its western neighbor, Westplains Water Storage District, adding 210,000 acres. Additionally, lands comprising about 18,000 acres were annexed to the District after the merger to form the current 604,000-acre District with an irrigable acreage of 567,800 acres. The original Westlands is referred to as Priority Area I and Westplains is referred to as Priority Area II, each under a separate water service contract with the Bureau. Priority Area III currently does not have a firm water-service contract and receives only surplus CVP water or hardship water when available from the Bureau during drought periods to preserve trees and vines.

	Date	Acres in Contract	Classes	Acre-Feet
First USBR contract[1]	1963[2]	604,000		900,000[3] 250,000[4]

	Total Acres	Irrigable Acres
Original size	376,000	337,000
Current size	604,000	570,000

Westlands Water District does not have an M&I contract for Project water, but the District does convey water to other entities that do have contracts for Project water. Westlands does deliver water for incidental agricultural uses and its contract allows for non-agricultural uses that have been termed M&I.

[1] Forty-year Contract scheduled for renewal in the year 2007.
[2] Contract signed in 1963 but became effective in 1968 with first delivery of water.
[3] Per 1963 Water Service Contract.
[4] Per 1986 Barcellos Judgment.

2006 Non-Agricultural Uses

1. Fresno County Public Works, Helm Community Water Service District, Lemoore Naval Air Station, City of Huron, City of Coalinga
2. Cotton gins, fruit and vegetable packing sheds, tomato-processing plants, nut processing plants
3. Farm equipment repair facilities
4. Poultry production facilities
5. Dust Control

Soils and Hydrology

The San Joaquin Valley is a wide bedrock basin filled with thousands of feet of alluvial sediment deposited by streams and rivers flowing out of the adjacent mountains on both the east and the west (Figure 4). Westlands is located near the centerline of this basin, bordered on the east by the Fresno Slough and on the west by the Diablo Range of the California Coast Ranges.

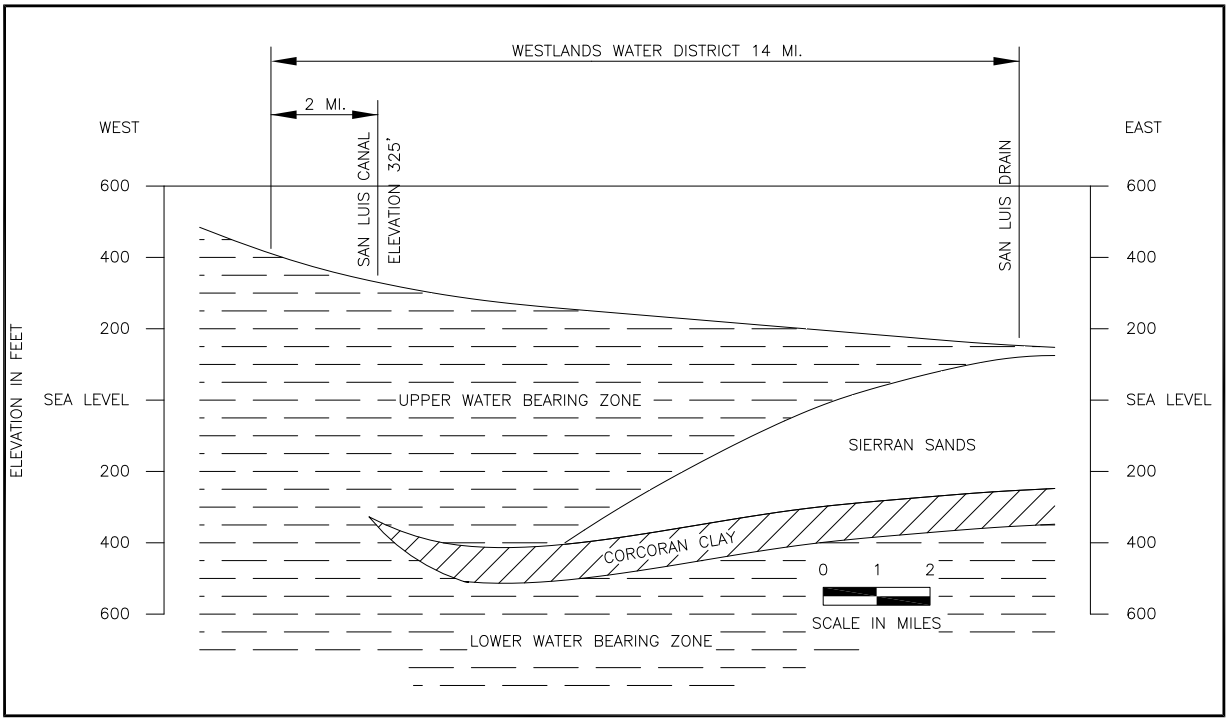

Figure 4: Generalized Hydrogeological cross section of Westlands.

The Sierra Nevada on the east side of the Valley is predominately comprised of uplifted granite rock overlaid in areas by sedimentary and metamorphic rock. Sierran alluvial deposits in the District consist primarily of well-sorted sands, with minor amounts of clay. The Sierran alluvium decreases in thickness and increases in depth below the surface toward the west. These

coarse-textured sediments are characterized by high permeability and a low concentration of water-soluble solids.

One of the principal subsurface geological features of the San Joaquin Valley is the Corcoran Clay formation. Formed as a lakebed about 600,000 years ago, this clay layer ranges in thickness from 20 to 200 feet and underlies most of the District. Varying in depths from 200 to 500 feet in the Valley and to 850 feet along the Diablo Range, the Corcoran Clay divides the groundwater system into two major aquifers ï a confined aquifer below and a semi-confined system above.

The Diablo Range consists of complex, folded, and uplifted mountains that are composed predominantly of sandstones and shaleôs of marine origin. These sandstones and shaleôs contain salts, as well as trace elements such as selenium. Eroded by creeks flowing from the Diablo Range, sediments form gentle sloping alluvial fans. The texture of the Diablo Range deposits depends on the relative position on the alluvial fan and ranges from coarse sand and gravel to fine silt and clay. Generally, those portions of Westlands lying high on the alluvial fans have permeable, medium-textured soils. With decreasing elevation from the west to east, soil textures become finer. These fine textured soils are characterized by low permeability and increased concentrations of water-soluble solids, primarily salts and trace elements.

The preliminary information in Appendix C ñGeneral Soil Map, Westlands Water Districtò provided by the Hanford Soil Survey Office of the Soil Conservation Service.

Soil Association	Estimated Acres	Effect on Water Operation and Management
Tachi-Armona Gepford	1,000	Appendix C
Westhaven-Panoche-Excelsior	47,000	Appendix C
Ciervo-Cerini-Lillis	72,000	Appendix C
Lethent-Panoche-Westhaven-Cerini	40,000	Appendix C
Ciervo-Cerini-Panoche, Saline-Sodic	57,000	Appendix C
Ciervo-Cerini-Panoche	342,000	Appendix C
Panoche-Cerini, Subsided	45,000	Appendix C
Total	604,000	

Agricultural Drainage

Salinization, or salt build-up in the soil, is one of the oldest problems faced by irrigated agriculture. Complicating Westlandsô salinity problems is its soil structure in some areas where dense clay layers of varying depth and thickness restrict natural drainage. This causes an accumulation of unused irrigation water above the clay layers, resulting in a near-surface saline water table. Lands that are severely affected by a saline water table need artificial drainage facilities or in some cases conversion to non-irrigated use.

The original authorization for Westlands Water District included provisions for drainage

service, but these facilities were never completed. Prior to construction of San Luis Unit facilities, it was believed that approximately half of Westlands would eventually need drainage service to remain productive. However, continuous monitoring and experience indicates that the drainage problem may not be as severe as previously believed. Much of the problem can be eased, though not fully eliminated, with intensive irrigation management. Even so, salts must ultimately be exported from the area to achieve salt balance and maintain land productivity.

The effects of the accumulation of agricultural drainage-borne selenium in waterfowl led to the closure of Kesterson Reservoir in June 1986, which was the temporary terminus for the San Luis Drain. Ultimately, the drain was to terminate in the Delta. This made it more essential than ever to manage irrigation as efficiently as possible in the drainage-collector system service area and elsewhere in the District. Westlands currently has no outlet for subsurface drainage water, but a litigation judgment has ruled that the United States continues to have an obligation to provide drainage service, which is being appealed by the U.S.

Shallow groundwater can restrict crop root development resulting in a reduced yield. Most crops can use shallow groundwater as long as the salt concentration is not too high for the particular plant and the roots do not become waterlogged. Depth to shallow groundwater has been monitored in the District for more than 30 years. Shallow groundwater levels are typically highest in April after pre-irrigation and lowest following the cropping season in October after crops have extracted a portion of the shallow groundwater.

This Agricultural Drainage problem was addressed in the San Joaquin Valley Drainage Report published in 1990. Achieving the recommendations in this report was substantial deference as given in the 1992 CVPIA legislation as part of this water management plan.

The recommendations from this report for the Westlands sub-area included:

1. Deep percolation on 159,300 acres of drainage-affected lands can be reduced to 0.4 acre-feet per acre by improved irrigation management.
2. Reusing drainage water to irrigate about 12,100 acres of salt-tolerant trees and halophytes.
3. Operating 400 acres of evaporation ponds and about 1,500 acres of solar ponds.
4. Pump the semi-confined aquifer under about 19,000 acres of land.
5. Retiring 33,000 areas of irrigated agricultural lands.

While the need for a drainage outlet for the District is still a necessity, Westlands is in substantial compliance with the first recommendation. The average deep percolation for irrigated lands in the District during the period 1978 to 1996 as presented in table 14 of this report was 0.47 AF/Acre. Additionally, District data from analysis of the Irrigation Improvement Program during the years 1986-1991 showed that deep percolation on lands with a water table within the 6 feet of the soil surface averaged 0.23 AF/Acre on 168 fields within the District. These data would indicate that lands with a drainage problem are in compliance, and additionally, that the average deep percolation on all irrigated lands within the District complies with this goal. If all 604,000 acres of land within the District are considered, the average deep percolation is 0.42 AF/Acre.

Demonstration project for recommendation 2 have been ongoing for the past 5 years at two locations within Westlands. These demonstrations are being conducted by the Westside Resource Conservation District under a grant from the Bureau of Reclamation to establish the economic feasibility of this approach. The problems with practical hazing methods and bio-accumulation in waterfowl have limited the adoption of evaporation and solar ponds for disposing of subsurface drainage waters in this area.

Pumping of the semi-confined aquifer has not been an attractive recommendation due to lack of options for the use of the water. Westlands limited water supply could be enhanced if this water were of good quality, and would probably have been readily adopted.

In 1997, the USBR initiated a voluntary land retirement program, funded by the CVPIA Restoration Fund. This program expected to purchase about 15,000 acres of drainage affected lands in the CVP service area to remove them from irrigated agriculture in 1998 and 1999. These actions were delayed pending preparation of satisfactory Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) studies. The draft EA and FONSI documents propose that approximately 7,000 acres will be retired in the District. The water allocation on the retired lands will remain with Westlands due to the signed agreement between the U.S. and Westlands. Westlands participates in the purchase of the lands in exchange for the water allocation off the land.

The U.S. Court of Appeals for the Ninth Circuit (February 2000) concluded that the Department of Interior must provide drainage service to the District and the Bureau of Reclamation developed a Plan of Action (April 2001) outlining the proposed efforts in providing drainage service and considering a variety of options. The first phase resulted in the Preliminary Alternatives Report, published in December 2001. The second phase of the Plan of Action was the preparation of a Plan Formulation Report, published in December 2002. The third phase produced the Final EIS and the San Luis Drainage Feature Re-evaluation Record of Decision (ROD)

In a collaborative effort between the San Luis Unit water districts and the San Joaquin River Exchange Contractors Authority, the Westside Regional Drainage Plan developed in May 2003. The plan included adaptive management, land retirement of up to 200,000 acres, groundwater management, source control, regional reuse, treatment, and salt disposal. The plan calls for identification of sound and effective projects to manage drainage.

In March 2007, the USBR released the ROD[5] and the In-Valley/Water Needs Land Retirement Alternative was selected. The alternative selected is the plan closest to the Westside Regional Drainage Plan. This alternative includes drainage reduction measures, drain-water reuse facilities, treatment systems, evaporation ponds and includes retiring 194,000 acres of land from irrigated farming. Implementation would require appropriation of funds by Congress and the apportionment of such funds by the Office of Management and Budget.

[5] http://www.usbr.gov/mp/sccao/sld/docs/sld_feature_reeval_rod.pdf.

Climate

Annual precipitation in Westlands averages about seven inches, the majority of which falls during the months of December through March. Summer maximum temperatures frequently exceed 100ę F and winter temperatures occasionally fall below freezing. With a mean annual temperature of 62ę F, the area has an average frost-free growing season of 280 days.

Northern Zone[6]

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precip.	1.46	1.41	1.51	.69	.26	.07	.01	.01	.20	.40	1.07	1.10	8.18
Temp.	46	51	55	61	67	73	78	76	72	64	53	45	62
Max. Temp.	54	62	67	75	83	90	94	93	88	80	66	54	76
Min. Temp.	38	40	43	46	52	57	61	60	57	49	40	35	48

The average wind velocity and direction are **4.7 mph NW** and **336** average annual frost-free days.

Central Zone[7]

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precip.	1.60	1.52	1.35	.51	.21	.06	.01	.05	.26	.47	.81	.91	7.76
Temp.	46	51	56	61	67	73	77	77	73	65	53	45	62
Max. Temp.	54	62	68	75	82	88	93	93	88	80	66	54	75
Min. Temp.	37	40	44	47	52	57	61	61	57	50	41	36	49

The average wind velocity and direction are **5.1 mph NW** and **339** average annual frost-free days.

Southern Zone[8]

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precip.	1.48	1.46	1.36	.52	.24	.05	.02	.02	.21	.38	.80	.89	7.43
Temp.	45	51	57	62	68	74	79	78	74	66	54	45	63
Max. Temp.	54	62	68	76	83	89	94	94	89	81	66	54	76
Min. Temp.	37	41	45	48	53	58	63	62	59	51	42	36	50

The average wind velocity and direction are **4.1 mph NW** and **343** average annual frost-free days.

Environment

The ROD lists three endangered or threatened species that are in need mitigation measures.

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[6] CIMIS Weather Station, Murrieta Farms/Adams & Hwy 33, Tranquillity, California; 1976-98, Rainfall, Mendota Dam/ CIMIS Weather Station, 1960-1998. Temperatures are in degrees Fahrenheit and precipitation in Inches.

[7] CIMIS Weather Station, University of California, Westside Field Station, Five Points, California; 1982-98, Rainfall, 1962-1998. Temperatures are in degrees Fahrenheit and precipitation in Inches.

[8] Westlands Automated Weather Station, 2 Miles SW, Huron, California, 1982-98 and Rainfall, Westhaven, California/WWD, 1960-1998. Temperatures are in degrees Fahrenheit and precipitation in Inches.

Giant Garter Snake (*Thamnophis gigas*)
San Joaquin Kit Fox (*Vulpes macrotis mutica*)
California Least Tern

The ROD In-Valley/Drainage-Impaired Land Retirement Alternative was identified as the Environmentally Preferred Plan because it requires the least amount of evaporation ponds and associated treatment systems. Mitigation Measures adopted by the USBR as part of ROD will an adaptive management approach in cooperation with the Mitigation Work Group and permitting agencies. ñUse of an adaptive management approach in conjunction with targeted monitoring will é minimize adverse effectsò[9]

Environmental Resources Within the District[10]

Name	**Estimated Acres**	**Improvement or management by District or others**
Mendota Wildlife Area	155 in WWD (12,425 total)	Owned and managed by CA Dept. of Fish & Game (F&G).
WWD Duck Pond	4±	WWD provides land and water, F&G Provides management
Pilibos Wildlife Area	127	Wildlife habitat operated under joint Agreement between F&G, Department of Water Resources (DWR) and USBR.

Recreational Resources Within the District

Name	**Est. Acres**	**Improvement or Management by District or Others**
Fishing in the San Luis and Coalinga Canals	-0-	--

[9] ROD, p. 21
[10] The locations are plotted on the Map in Figure 5.

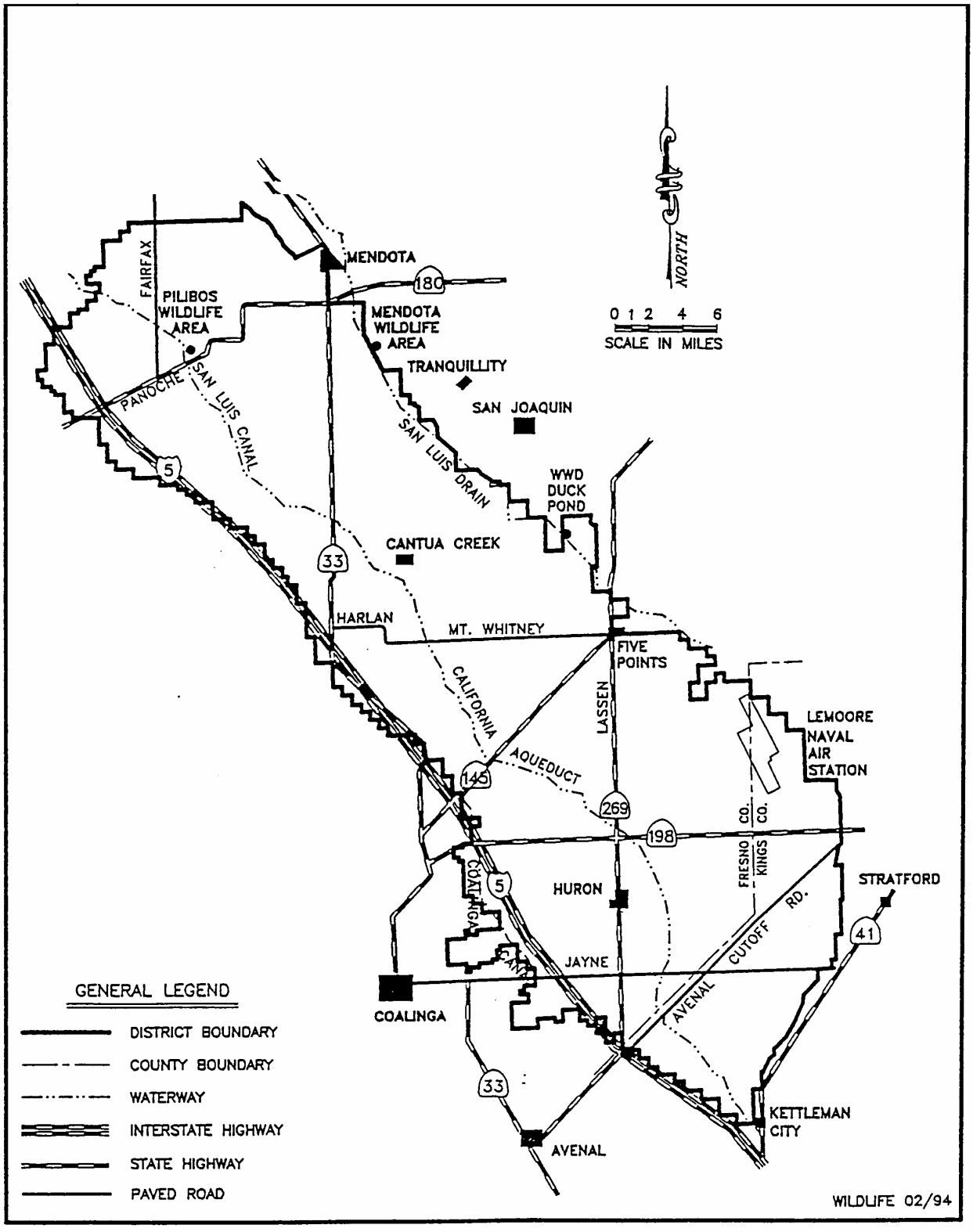

Figure 5: Location of Environmental and Recreation Resources.

Water Distribution System

Westlands is in the San Luis Unit of the CVP. The main water supply features of the Unit are completed and operational, including the Delta-Mendota Canal, the San Luis Dam and Reservoir, the San Luis Canal (SLC), and the Coalinga Canal (CC). However, lift pump stations on 12 percent of Westlands' laterals proposed for completion are yet to be constructed. These laterals and lift stations will be a major part of any future Westlandsô Distribution System Completion Project. In addition, Westlands operates and maintains the 12-mile concrete-lined CC and the Pleasant Valley Pumping Plant, which have a capacity of 1,100 cubic-feet per second.

District Facilities

Westlandsô permanent distribution system consists of a closed, buried pipeline network designed to convey irrigation water to 160- or 320-acre land units from the SLC, the CC, and a 7.4-mile unlined canal from the Mendota Pool. The distribution system was built between 1965 and 1979. The area served by the completed system serves approximately 88 percent of the irrigable land in the District, including all land lying east of the SLC. The areas in Westlands where the distribution system is completed are shown in Figure 6.

Water is distributed through 1,034 miles of buried pipe, varying in diameter from 10 to 96 inches. Gravity and pumps feed 38 lateral pipelines from the east bank of the SLC, while water is pumped into 27 laterals on the west bank. Six partially completed laterals are served from the CC. The basic design flow rate of each on-farm delivery system is one cubic-foot per second per 80 acres. The water is delivered with a minimum head pressure of five feet above the high point of the parcel. Farmers control individual deliveries at each of the more than 3,000 metered outlet valves.

Most of the land in the original Westlands is east of the SLC and slopes gently from an elevation of about 320 feet to about 160 to 200 feet at the eastern boundary. Most of this land has gravity service from the SLC. Small re-circulating pumping plants at the headworkôs of each of the gravity laterals pressurize the laterals serving lands adjacent to the SLC that are too high in elevation to be served through the gravity laterals. The land lying west of the SLC, most of which is in Priority Area II, is at higher elevations than the SLC. It is served by pumping from the SLC and by gravity from the CC.

Most of the remaining District lands are served by farmer-constructed temporary diversions. The farmers maintain these facilities for Westlands. Some of the pumping costs are offset by the availability of less expensive CVP power. Approximately one-third of the land between the SLC and the CC is served by pumping from the SLC. The other two-thirds are served by laterals from the CC.

Facilities Maintenance and Replacement

Westlands conducts an extensive ongoing preventive maintenance program for all its equipment and facilities. There have been no past system failures that have resulted in a

significant loss of water.

Distribution-system maintenance budgets vary depending on water availability. Annual maintenance expenditures were $3.86 million for the water year 2006-07. In years of reduced supply, the District utilizes O&M reserve funds to maintain the system.

In addition, the District has an ongoing policy for the construction and installation of new delivery facilities, and $210,000 worth of metered deliveries were added to the distribution system in the 2006-07 water year. The total District investment in the distribution and drainage system as of February 28, 2007, was $193.6 million. The present value of the completed distribution system is in excess of $500 million and is comprised of the following components.

Diversion Point	**Description**
63 Turnouts from the San Luis Canal 6 Turnouts from the Coalinga Canal 28 Temporary Turnouts from San Luis Canal and 19 from Coalinga Canal	Metered, piped laterals
Pumping Plants 6-1 and 7-2 from Mendota Pool	Metered, unlined canal to pumping plants

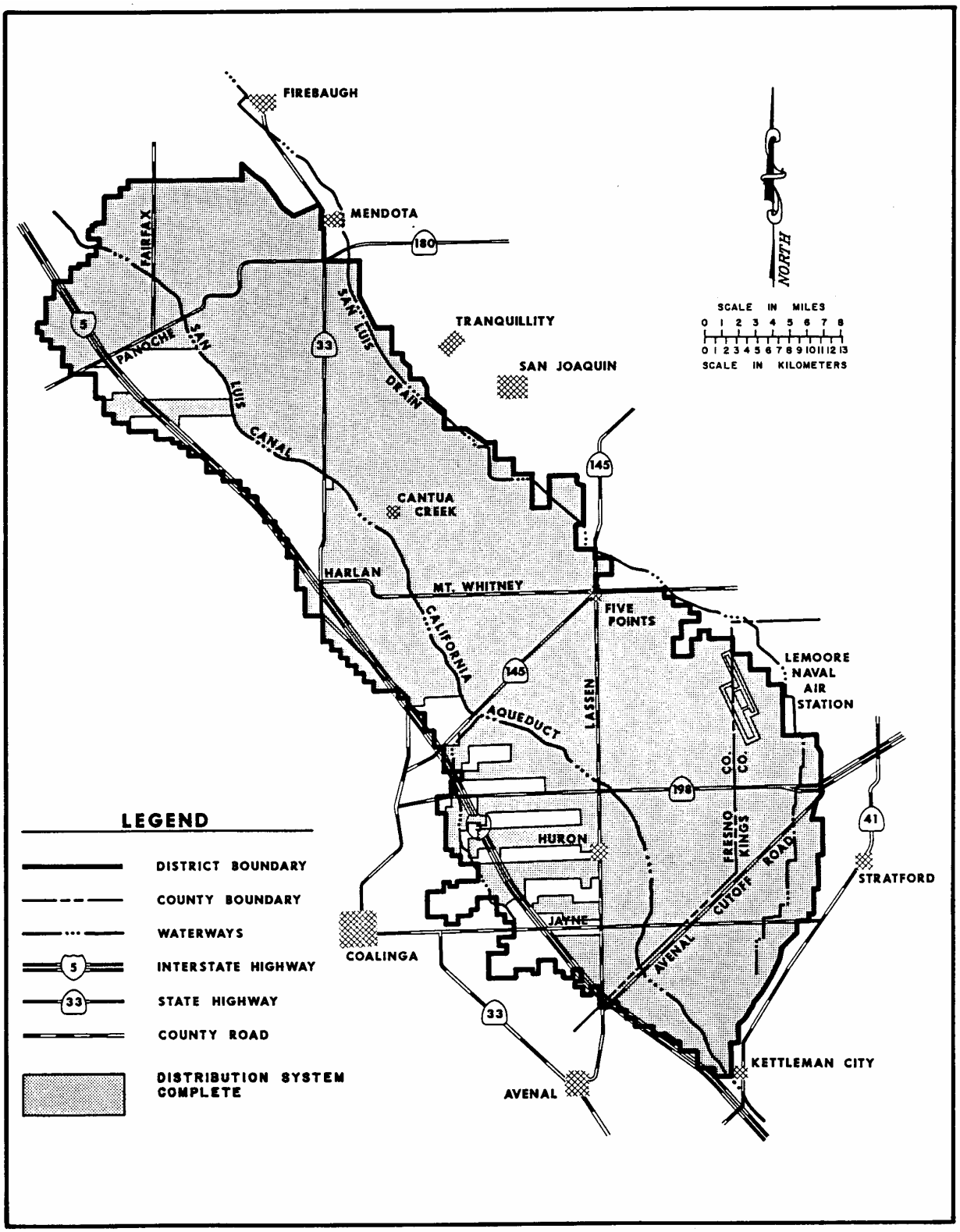

Figure 6: Areas where distribution system is complete.

Water Measurement

All water delivered, for both agricultural and non-agricultural purposes, is currently accounted for through any one of approximately 3,700 meters. The use of meters to measure water delivery is a cornerstone of any water conservation program. Meters enable water managers to accurately allocate limited supplies and recoup true delivery costs. They also enable the farmer to precisely measure the amount of water delivered and calculate irrigation efficiency. Without a reliable meter-based delivery system, farmers are more likely to apply a safety factor one each irrigation to avoid crop yield reducing under irrigation.

Recognizing these benefits, District founders elected to install flow meters as each lateral was originally constructed. Each of the 3,075 original agricultural deliveries cost $1,400, in 1991 dollars, for a total of $4.3 million. District-wide meter accuracy is within plus or minus two percent as determined from calibration tests. Westlandsô Meter Shop, located at the Districtôs Five Points Shop and Field Office, is among the states most modern. Meters are calibrated in the shop on a fixed schedule and repaired as needed.

All customer water needs, including those covered by this urban plan, are satisfied from the agricultural contract. Non-agricultural accounts are classified as Municipal & Industrial (M&I) accounts, but these accounts could be more specifically classified as M&I and Incidental Ag accounts, as defined by the water delivery contract with the USBR. M&I accounts are those that fall into the Commercial, Industrial and Institutional (CII) classification. Out of the 183 non-agricultural accounts, 51 could be classified as ñtrueò M&I accounts for the 2006 water year, March 1 through February 28.

Incidental Ag accounts would be those accounts providing for water needs incidental to agricultural production activities, such as shops, houses, and wash racks. Seventy-Eight percent of the ñM&Iò water accounts reported to the USBR could be classified as ñIncidental Agò water.

All water delivered by the District is metered, but none of the water is treated by the District. All meters are read on a monthly basis. Smaller meters, 2 inches or less, are generally of a turbine type and larger meters are a propeller type. All meters are serviced on an as needed basis and on a periodic basis, depending on size. Calibration of District meters averages within plus or minus 2 percent.

Turbine meters are generally serviced in place on an annual basis and are replaced when repair parts are no longer available, become unserviceable or become obsolete. The factory calibration is utilized throughout the life of the meter. The larger propeller meters are removed, returned to the meter repair facility and re-calibrated on a four-year cycle. See Table 3 for M&I Water Meter Data.

Westlandsô bills monthly for all water delivered in the District, but in special cases M&I accounts are billed on an annual basis. All water meters are read and recorded monthly. The Customer Accounting Department utilizes software developed in-house to track all water delivered in the District. M&I water is billed for either one or two acre-feet in advance, based on the prior year use levels and the advance applied to actual use at the end of the year.

Table 3: M&I Water Meter Data

Meter Size	Number	Accuracy (percentage)	Reading frequency (days)	Calibration frequency (months)	Maintenance frequency (months)
1.0nj	31	Factory	30	Factory	12
1.5nj	46	Factory	30	Factory	12
2.0nj	82	Factory	30	Factory	12
3.0nj	35	+/- 2%	30	48	48
4.0nj	40	+/- 2%	30	48	48
6.0nj	5	+/- 2%	30	48	48
8.0nj	1	+/- 2%	30	48	48
10.0nj	2	+/- 2%	30	48	48
14.0nj	5	+/- 2%	30	48	48

Description of Meters

Meters that fail or are inaccurate are repaired and recalibrated immediately. To ensure accuracy, meters are placed on a four-year preventive maintenance cycle ensuring that each is overhauled and recalibrated at least quadrennial. O&M Reserve funds are used for preventive maintenance during water-short years when funds are short.

In addition to testing approximately 1,000 District meters annually, the District also tests and calibrates an additional 250 meters installed by farmers on well discharges in conjunction with Westlandsô Pumped Groundwater Exchange and Groundwater Integration Programs. These conjunctive use Programs maximize the use of the farmersô groundwater wells during drought periods. Operation and maintenance of all wells is the farmersô responsibility. Under the present program, accurate metering allows both the farmers and the District to carefully manage and account for all water delivered. Other programs such as the Irrigation Management Information System (IMIS) are built on the foundation of a solid water-metering program.

The Districtôs conveyance system is almost all buried pipeline, but the District does operate the Coalinga Canal for the USBR. All laterals have headworks on the California Aqueduct or the Coalinga canal.

Miles Unlined Canal	Miles Lined Canal	Miles Piped	Other
7.4	0	1,034	0

Westlands does not have large storage reservoirs, tailwater recovery systems, or groundwater recharge facilities. Westlands has 16 small regulating reservoirs designed to act as a controlling mechanism at the upper reach of each pumping plant.

District Operations

In general, district farmers apply for an allocation from the USBR contract that the

district administers. District regulations and operating procedures are included in the Appendix B. A water user can take delivery of their allocation as needed, through out the season, which extends from March thru September. The March water year beginning allows the water user to better manage and utilize their allocation by adjusting their management decisions for the rainy season, rather than having to make the same decisions at the end of December, as was necessary previously.

Westlands operates an arranged rate-demand water ordering system. Farmers must notify the District 24 hours prior to beginning the irrigation. Flows are usually ordered in multiples of 24-hour periods, but can be adjusted for shorter periods with District approval.

Reclamation Law

Because Westlands contracts with the Bureau for water, its farmers are subject to Reclamation law and regulations, a body of statutes and rules governing the distribution and payment of federal Project water. The law also governs the repayment obligations to the United States for construction of the numerous Project facilities throughout the 17 western states.

Federal Reclamation law provides for interest-free repayment of the construction costs of irrigation Project facilities. It also limits the amount of land on which a landowner can receive low-cost water up to 160 acres (320 acres for a married couple). Acreage limitation does not apply to leased land.

Major changes were made to the law by the Reclamation Reform Act of 1982 (RRA). RRA increased the ownership limitation for individuals in districts with new or amended contracts to 960 acres, and for individuals who so elected. An individual is defined as an immediate family member, i.e., a person, his or her spouse, and/or a dependent. It also imposed new pricing requirements, which, among other things, eliminated the interest-free repayment of Project capital costs for water used on land leased in excess of the 960-acre entitlement.

In Westlands, acreage limitation has resulted in the orderly breakup of large private landholdings. Table 4 shows the number of farms has increased and the average farm size have decreased to 905 acres. Table 5 shows almost 73 percent of the farms are 960 acres or less. This percentage would be greater if equivalency acreage is considered.

Table 4: Irrigable Acreage Trends

Year	Number of Water Users	Total Acreage[11]	Average Farm Acreage[12]
1970	84	176,261	2,098
1975	210	461,498	2,198
1980	243	489,789	2,016
1985	289	503,917	1,744
1990	613	530,441	865
1995	600	542,763	905
2000	628	564,191	898
2005	699	560,547	802

Table 5: Water User Size
December 1995

Farm Size (Acres)	Number of Farms[13]
320 or less	150
321 to 960	354
961 to 1,280	125
1,281 to 5,000	61
5,000 or more	10

U.S. Bureau of Reclamation Water Costs

Westlands purchases water from the Bureau at a variety of costs depending upon the RRA status of the landowner, farmer, or irrigated land. Following is a description of the Bureau water rates.

1963 Contract Rate

Applies to water provided to lands held by individuals under prior law (the 160-acre entitlement), but are not subject to full cost (Hammer Clause). The original 1963 Contract rate is fixed at $8 per acre-foot until the Contract is renewed.

Operation and Maintenance (O&M) Rate

Applies to water provided under the 1963 Contract to lands, which are subject to the RRA, but are not subject to full cost (less than 960 acres). This rate covers the Bureauôs estimated annual costs of delivery and is set each year based on Bureau estimates. Actual O&M costs are determined by the Bureau at the end of the water year. Pursuant to Public Law 99-546, the District is billed for any shortfall between estimated and actual costs. If this shortfall is not paid, it becomes an interest-bearing obligation of the District to the Bureau.

[11] Irrigable acreage eligible to receive Project water, not adjusted for equivalency.
[12] Farms eligible to receive Project water.
[13] Based on 600 water users purchasing Project water for 542,763 acres in December 1995.

Cost-of-Service Rate

The Cost-of-Service rate applies to all water other than that provided under the 1963 Contract, unless the land is subject to full cost. This rate is adjusted annually by the Bureau and includes both the O&M charge, and repayment of amortized capital costs.

Full-Cost Rate (RRA)

Applies to water for (1) land in excess of the 960-acre entitlement farmed by an individual who is subject to the RRA and (2) all land under extended recordable contracts, as specified in the 1987 amendments to the RRA. In addition to the annual O&M and capital cost components, this rate includes interest on unpaid capital costs.

Full Cost Rate (Hammer Clause)

Applies to water for leased land in excess of the 160-acre entitlement which is farmed by an individual who is subject to prior law. This rate includes the same components as the full-cost (RRA) rate, but has a higher interest rate component.

The Districtôs water rates, which include USBR water costs, paid by farmers are shown in Tables 7 & 8.

Table 6: 2006-07 Water Rates
Central Valley Project Water
(Based on 100% CVP Supply ï 1,274,118 AF Total Supply)

	1963 Contract				Provisional		
Description	Contract	O&M	New Law Full Cost	Old Law Full Cost	Cost of Service	New Law Full Cost	Old Law Full Cost
AGRICULTURAL WATER RATES							
United States Bureau of Reclamation [1]							
Water Rates	8.00	16.55	56.24	71.24	34.07	56.24	71.24
Restoration Fund	8.24	8.24	8.24	8.24	8.24	8.24	8.24
San Luis Delta Mendota Water Authority [2]							
Authority O&M	-	16.95	16.95	16.95	16.95	16.95	16.95
Westlands Water District [3] [4]							
SLDMWA True-up	-	-	-	-	-	-	-
Contract Assignment Cost Shift Credit	-	-	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Actual USBR O&M	-	3.00	3.00	3.00	3.00	3.00	3.00
O&M Deficit	-	-	-	-	-	-	-
Prior Years Restoration Fund [5]	0.12	0.12	0.12	0.12	0.12	0.12	0.12
District O&M	9.31	9.31	9.31	9.31	9.31	9.31	9.31
Drain Repayment [5]	0.07	0.07	0.07	0.07	0.07	0.07	0.07
Water Delivered Benefit	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Water Exchange Obligation [5]	-	-	-	-	0.38	0.38	0.38
SWRCB Water Rights Fee	0.62	0.62	0.62	0.62	0.62	0.62	0.62
Total Ag Water Rate	27.39	57.18	95.82	110.52	73.71	95.88	110.88

MUNICIPAL AND INDUSTRIAL WATER RATES	
Acquired Supply	$ 295.28
Acquired Supply – NASL	438.00

Notes:
[1] U S Bureau of Reclamation rates are calculated on the basis of approximately 66% CVP water supply
[2] San Luis Delta Mendota Water Authority rates are calculated on a water use estimated of 85%
[3} District rates are calculated on the basis of 100% CVP water supply plus other water
[4] District rates are calculated assuming no loss of revenue due to unused water
[5] Rate components not included in Contract Assignment water rates

Table 7: 2006-07 Charges and Credits
Central Valley Project Water
(Based on 100% CVP Supply ï 1,274,118 AF Total Supply)

CHARGES AND CREDITS	Amount	Unit
Land Based Charges [1]		
Long-Term Water Supply D.S. ï Area 1 and Area 2	0.8297	AC
District Water Supply D.S. ï Area 1	7.5343	AC
District Water Supply D.S. ï Area 2	20.4335	AC
Extraordinary Repairs of Pipe ï Area 1 and Area 2	1.2910	AC
Monitoring Costs ï Area 1	0.5241	AC
Monitoring Costs ï Area 2	0.1548	AC
Landholder Committee Costs ï Area 1	0.3650	AC
Landholder Committee Costs ï Area 2	0.3096	AC
Allocation Charges		
Water Allocation Benefit [2]	0.72	AF
Usage Charges		
Contract Assignment Cost Shift Mercy Springs DD#1	1.21	AF
Contract Assignment Cost Shift Mercy Springs DD#2	1.14	AF
Overuse of Water Supply	Blended Supplemental or Actual Rate	AF
Administrative Fee [3]	44.31	Mile
Distribution System Usage ï Without Facilities [4]	0.7290	AC
Distribution System Usage ï With Facilities [5]	4.0502	AC
Groundwater Management Program and Temporary Facilities		
Groundwater Management Program Power	Varies by Facility	AF
Temporary Facilities Power Surcharge	Varies by Facility	AF
Temporary Facility Credit [6]	(3.16)	AF
Account Monitoring Charges		
Overuse Monitoring	2,100.00	EA
Delinquent Payment Monitoring	14.00	EA
Advance Payment Monitoring	500.00	EA
Municipal and Industrial		
M&I Inspections [7]	26.72	EA
Raw Water Sampling Program [8]	129.63	EA
Acquired Supply Advance	295.28	EA

Notes:
[1] Based on irrigable acres; adoption subject to public hearing
[2] Water Allocation Benefit charges are billed on 1963 Contract and Provisional water allocated as of July 1
[3] Charged per mile of lateral drained for each delivery point
[4] Collected if water delivered to non-assessable land with User-installed facilities for which the repayment obligation has not been prepaid
[5] Collected if water delivered to non-assessable lands with District-installed facilities for which the repayment obligation has not been prepaid
[6] Temporary Facility Credits are billed on a per acre-foot basis for water delivered through temporary facilities
[7] M&I Backflow Inspection costs are billed annually to each non-agricultural connection
[8] Billed Annually to M&I Water Users with Reporting Requirements
[9] Advance requirement doubles if prior year annual use is greater than one acre-foot. Based on adopted rate February 21, 2006.

District Revenue Sources

The Districtôs fiscal year begins on March 1 and ends on the last day of February. The budget adopted in February may be changed during the year as necessary. Westlands raises annual operating revenue from water sales that are billed monthly. In a normal year, its water sales revenue is used for all operating expenses. In addition, assessments are collected for non-operating costs such as repayment for the Districtôs distribution and drainage collector systems.

The Districtôs O&M component of the water rate covers all costs associated with supplying and distributing water to customers, in addition to acquisition of capital assets and preventive maintenance programs. Rates may subsequently be adjusted if water supplies change. District O&M is added to the cost of CVP water.

Agricultural deliveries from the farmerôs temporary facilities incur a power surcharge based on pumping lift, which is added to the water rates to recover pumping costs beyond that estimated for a permanent distribution system. The power surcharge applies to most lands west of the San Luis Canal and Coalinga Canal. Agricultural water rates for service through temporary facilities that are operated and maintained by the farmers are reduced for avoided Westlandsô maintenance costs.

Untreated municipal and industrial (M&I) water is delivered to government facilities including Naval Air Station, Lemoore; area businesses; labor facilities; cotton gins; crop-grading stations; processing plants; and private homes. M&I water is billed for a minimum allocation of two AF, payable in advance. M&I water use accounts for less than 6,500 AF, or less than 1 percent of annual water sales.

Agricultural Water Payments

Westlandsô farmers apply for an allocation of agricultural water in December for the forthcoming water year and enter into a contract with the District to accept and pay for it. The Bureau estimates the amount of water available to contractors as early as mid-February with supplies usually finalized by May. The available water supply is allocated to eligible farmers under the Districtôs Regulations for the Allocation of Agricultural Water.

Payment for water and power used is due by the 25th day of the following month. In the event payment is not made for water allocated or used, future deliveries are suspended and the amount owed is added to the annual assessment of the land on which the water was allocated or used.

Landowner Assessments

Since 1984, the District has used the Benefit Assessment Valuation Schedule method of collecting funds to repay the United States for construction of the District's distribution and drainage collector systems.

Under the benefit valuation method, assessments are based on the relative benefits

bestowed to the land by the District. For example, lands served by the Districtôs distribution system are assessed at a higher rate than the 12 percent of lands not yet served.

The annual repayment obligation to the United States for costs incurred in building the Districtôs distribution and drainage collector facilities currently stands at just over $5 million. Table 8 lists the per-acre assessments for various land classes. From 1984 to 1989, this obligation was collected entirely through direct landowner assessment. To make the assessment process more equitable, in 1990 the District began to collect 50 percent of the repayment obligation through landowner assessments and 50 percent as a component of the water rates. The repayment obligation will be paid off by 2018.

In 1988 after the closure of Kesterson Reservoir and the resulting drainage provisions of the Barcellos Judgment (described in the following section), the District began to levy an assessment of $5 million per year as up-front financing for future drainage projects. The trust fund, with accumulated interest, was intended to grow to $100 million. With the Bureauôs failure to meet the Barcellos Judgmentôs deadline of December 31, 1991, to adopt a drainage plan for Westlands, the District canceled Drainage Trust Fund assessments and sought a court order for the release of the $17.6 million already accumulated.

On several occasions, the Board of Directors has levied one-time assessments for specific purposes such as refunds of landownersô overpayments and initial costs of the Distribution System Completion Project. In 1992 due to the 25 percent water supply, the Board levied a special administrative costs benefit assessment to fund certain parts of the Districtôs operating budget that are of general benefit.

The Sagouspe agreement entered into on 29 April 2002 between Sagouspe, et al. (Area II lands) and the District. This agreement required the District to acquire sufficient lands to make an equal allocation of 2.6 to the Area II lands on the west side of the San Luis Canal. Area II landowners pay the first $2.5 million in annual Debt Service and thereafter the Dept Service is split dollar-for dollar on the remaining assessable acres with Area I and Area II. On 1 March 2008 the annual Debt Service is adjusted to reflect 70% for Area II and 30% for Area I lands on remaining assessable acres. The Debt Service will be paid off by 1 March 2029.

District Financial Resources Summary

The amount of revenue from water sales declined markedly in 1991 under a 25 percent water supply. District O&M charges were held at a level insufficient to offset the lower volume of CVP water to avoid added economic pressure on farmers from the continuing drought. This necessitated substantial cost cutting and drawing of funds from District reserves. Except for special assessments, as noted in the previous paragraph, income from assessments funds the Districtôs long-term repayment obligations to the United States (distribution and drainage collector systems); and it is not used for normal operating expenses.

Believing it to be more equitable, in 1990, the District began to collect 50 percent of the obligation through landowner assessments and 50 percent as a component of the water rates. The repayment obligation will be paid off by 2018.

Legal Background and Issues

The District is constrained in its water supply and allocation and drainage efforts by a landmark court decision known as the Barcellos Judgment. A lawsuit involving a number of water delivery and drainage issues was filed by District farmers and landowners against Westlands in 1979. In 1981, Westlands in turn sued the United States Government. The suits involved, among other issues, the Districtôs contractual entitlement to Central Valley Project (CVP) water and drainage service, the Districtôs service area, water costs, and allocation regulations. The suits were consolidated in Barcellos and Wolfsen, Inc., et al., vs. Westlands Water District, et al., and Westlands Water District, et al., vs. the United States, et al.

The litigation was resolved through a negotiated settlement between all parties which was subsequently approved by the District Court in the form of a judgment entered by the Court, commonly known as the Barcellos Judgment (December 1986).

Among other legal issues, the Judgment specifically:

- Upheld the validity of the 1963 Contract between Westlands and the Bureau for 900,000 AF of water to be delivered annually at the applicable 1963 Contract rate or the Reclamation Reform Act rate.

- Affirmed Priority Area Iôs right to timely apply for and purchase 900,000 AF of water annually. Unused Priority Area I water not timely applied for and purchased by Priority Area I is available for use in Priority Area II.

- Stated that the United States shall provide provisional water service of 250,000 AF at the ñcost-of-serviceò rate-pending conclusion of the Contra Costa Water District vs. Hodel, et al. and Westlands Water District Delta Environmental Impact Statement lawsuit.

- Directed the Bureau to pursue a good faith effort to provide an additional 100,000 AF of firm water (supplemental water) on a long-term basis to Priority Area II.

- Established guidelines for the allocation of CVP water within Westlands.

- Established a trust fund to collect $5 million per year for a total of $100 million in seed money for future drainage projects and gave the Bureau until December 31, 1991, to adopt a drainage plan for Westlands.

- Reaffirmed the Districtôs water service area.

Westlands Board of Directors approved a settlement to the long-standing lawsuit

Sagouspe, et al., vs. Westlands Water District, et al. in April 2002. The settlement requires Westlands to purchase drainage-impacted farmlands and redirect the water allocated to those lands to help equalized water allocations to Area I and Area II farmers.

Sumner Peck Ranch, a California corporation, et al., vs. Bureau of Reclamations, et al. lawsuit settlement was reached in December 2002. Under the settlement, Westlands will purchase approximately 33,000 acres of land over a three-year period and permanently remove the land from irrigated agriculture. The water currently allocated to those lands will be distributed to lands with the District to help equalize the amount of water allocated to Area I and Area II farmers.

The Central Valley Project Contract Renewal still has not been finalized and Westlands will be required to operate under interim contract renewal when the existing contract expires.

Water Shortage Contingency Plan

Westlands delivers small quantities of untreated, non-potable CVP water which is ultimately used for municipal and industrial (M&I) purposes by Lemoore Naval Air Station and by various rural commercial and residential customers located within the District boundaries. Westlands also conveys raw water to the Cities of Huron and Coalinga, which have separate water supply contracts with the USBR. No water is treated prior to delivery. Westlands has no treatment facilities to provide potable water supplies to these incidental non-agricultural customers. District staff has discussed this plan with representatives of Lemoore Naval Air Station, Huron, Coalinga, and Fresno County. This water supply shortage contingency plan does not deal with deliveries to Huron and Coalinga.

Westlands suffers under a water short situation even when 100% of the contract amount is available. Allocation and shortage procedures for agricultural water are presented in the Ag Water Management Plan for details on this topic. Even though M&I water supplies have been allocated under the agricultural contract and are currently last to be curtailed in a severe water shortage situation, discussions have occurred recently that propose the possibility of an M&I shortage provision.

Currently there are regulations to deal with wasteful use of agricultural water, but while there are no specific policies related to M&I waste, the M&I water delivered is technically ñAg Waterò and so falls under the Ag waste regulations. The reasons for this is that the M&I water deliveries are less than 0.5 percent of the water delivered by Westlands. Since the District is not responsible for the policies on the use of water conveyed to NAS Lemoore, this number falls to about 0.2 percent.

The highest level of annual non-agricultural water deliveries has been approximately 6,500 AF. Given the reductions in Westlandsô CVP water supplies due to federal regulatory restrictions, it is likely that future non-agricultural water deliveries will be reduced even with modest population increases in the area. This is because reduced agricultural water supplies from the federal government will lead to a reduction in processing-related uses and in the farm

labor population living in Westlands.

Estimates of water demand for the next 12, 24, and 36 months should be similar to the non-agricultural water use in an average water year, about 5,000 AF. The ñworst caseò water supply estimates for the next 12, 24, and 36 months is nil. Currently all non-agricultural water is part of the CVP contract supply. Since the extent of the additional regulatory restrictions is unknown at this time, this possibility cannot be ruled out. However, it has been the policy of the USBR to deliver a minimum of 75 percent of historical M&I use, even when agricultural allocations are considerably less than that. Other supplies from internal groundwater transfers are possible but because of uncertainty that groundwater can meet Title 22 standards and the lack of proximity to District distribution facilities, these supplies cannot be guaranteed.

The CVP allocation to Westlands is shared between agricultural, incidental agricultural and incidental non-agricultural water users. The Districtôs Regulations for the ñAllocation of Agricultural Water Within the Westlands Water Districtò (Appendix A) state ñThe Districtôs General Manager is authorized to set aside from the total entitlement whether they be from the Districtôs basic contract supply or some other general source of water, for each area of the District the amount of water needed for M&I purposesé .ò Historically, when the overall water supply has been reduced, the non-agricultural water allocation may not be reduced a similar percentage. In certain cases of severe reduction, it is likely that the District would receive CVP hardship water for health and safety purposes based on the statement of need.

Westlands believes that although there have been no mandatory reductions imposed on the Districtôs non-agricultural customers, water conservation has occurred during periods of reduced supply. This is apparent when comparing non-agricultural water use in full and reduced water supply years (in 1991 and 1992 water use was less than above average in each year). In the unlikely event, that the CVP allocates no water to Delta export water-service contractors and the allocation for M&I use is less than 75 percent of historical use, the District will purchase water from other sources including an Emergency Drought Water Bank. Mandatory rationing will be imposed to the extent that sufficient water cannot be purchased.

The Districtôs General Manager is authorized by the Board of Directors to prohibit the wasteful use of water in Westlands. Westlandsô Allocation Regulations state, ñThe unauthorized using, taking, or wasting of water may subject the water user to civil or criminal prosecution. The General Manager is authorized, after oral or written notice to the water user, if in his judgment, it is advisable and in the best interest of the District, to lock the delivery facilities of, or discontinue water service to, any water user.ò Additionally, the Westlandsô board may adopt a resolution on the use of non-agricultural water.

Each non-agricultural customer is metered according to AWWA standards, according to customer type. The price of non-agricultural water is set at the beginning of each year, based on the anticipated supply. District revenues from the sale of incidental non-agricultural water vary annually between one and two percent of the Districtôs overall revenues and have little influence on the Districtôs overall financial resources.

Plan of Action

The General Manager has the authority to discontinue water service if, in his judgment, water is being wasted. Additionally, the Board adopted a resolution prohibiting the waste of M&I water. The District is currently preparing information on M&I water conservation, which will be distributed to all M&I water users. The District is also encouraging other water suppliers (Cities of Huron and Coalinga, and Lemoore Naval Air Station) which receive water through Westlandsô distribution system to develop water conservation plans and water shortage contingency plans. Westlands will continue to read all meters in the District on a monthly basis.

Section 2

Water Resources Inventory

Water Supply

Unlike water agencies with more abundant supplies, Westlands must allocate (ration) water to its farmers, even in the wettest years. Its annual Contract entitlement from the Bureauôs Central Valley Project (CVP) is 1,150,000 AF. The annual safe yield of the confined underground aquifer adds about another 200,000 AF. The total water available is about 25 percent (350,000 AF) short of the 1.5 million AF required to water the entire irrigable area in the District.

The surface water supply is allocated to more than 535,000 acres eligible to receive Project water. (An additional 33,000 acres farmed in the District ineligible to receive Project water must rely solely on pumped groundwater.) The District has three separate priority areas of water allocation. During periods of drought, deficiencies are applied as an equal percentage of the Contract entitlement of each priority area.

The original Westlands entered into a 40-year water supply Contract with the Bureau in 1963, providing for the delivery of 900,000 AF annually. In 1965, the Bureau committed an additional 250,000 AF annually to the District, although the Bureau and Westlands recognized that amount was insufficient for the additional irrigable acreage.

The Merger Agreement between the original Westlands and Westplains Water Storage District was codified by California Water Law in 1965. It specifies that the original Westlands area have a priority right to the 1963 Contract water. The 900,000 AF delivered under the 1963 Contract, therefore, is allocated first to about 337,000 eligible acres in Priority Area I (the original Westlands area), providing about 2.6 AF/Ac.

The 250,000 AF allocation for Priority Area II (former Westplains area) provides only about 1.3 AF for each of the 187,000 acres eligible to receive Project water. An additional 18,000 eligible acres annexed to the District after the merger (Priority Area III) does not receive any allocation until and unless Priority Areas I and II have been allocated about 2.6 AF/Ac.

The 1963 Contract allows Westlands to purchase additional (interim) water from the Bureau when it is available, which is usually allocated to Priority Area II. Between 1975 and 1988, the District purchased a total of more than 1 million acre-feet of additional water to boost average annual deliveries from 1.15 to 1.23 million AF. Since 1988, interim water has not been available. In addition to the Project water supply, since 1989 the District has been actively engaged in water marketing and conjunctive use with other agencies and purchases from the State Water Bank. While providing neither firm, abundant, nor economical water, these sources have provided insurance against well failures and higher than anticipated crop water needs.

With the Sagouspe Agreement the District, will allocated 2.6 AF/Ac to both Area I and Area II landowners being on 1 March 2008. The Districtôs 1963 Water Contract ended on 29 February 2008 and an Interim Water Contract begins the next day. Under the Interim Contract Areaôs I & II will be treated the same but Area III will treated the same as in 1963 Contract. The Interim Water Contract renewed every two years until the signing of a new Water Contract.

DD1 was formed in 2000 for executing CVP Contract Assignments from Mercy Springs Water District (partial ï 6,260 AF), Centinella Water District (2,500 AF), Widren Water District (2,990 AF), and Broadview Water District (27,000 AF) comprised Priority Area II and Priority Area III lands. However, under the Districtôs rules for allocating water, that portion of DD1 comprised of Priority Area III lands do not receive an allocation of water from these assignments. DD2 formed in 2002 for purpose of executing an additional partial assignment (4,198 AF) of Mercy Springs WD CVP Contract.

The Districtôs water supply totals include DD1 and DD2. When the WWD CVP contract is renewed the Distribution District 1 Contract Assignments will be incorporated with the District contract.

Groundwater Supply

Farming in the Westlands area was originally used groundwater for irrigation. G. T. Willis drilled the first deep groundwater well in the District just west of present-day Lemoore Naval Air Station in 1909.

The groundwater basin underlying Westlands is comprised generally of two water-bearing zones: (1) an upper zone above a nearly impervious Corcoran Clay layer containing the Coastal and Sierran aquifers and (2) a lower zone below the Corcoran Clay containing the Sub-Corcoran aquifer. The location of these water-bearing zones is depicted on a generalized cross section of the District shown on Figure 3. These water-bearing zones are recharged by subsurface inflow from the east and northeast, the compaction of water-bearing sediments, percolation of pumped groundwater, and percolation from imported and natural surface water. Land subsidence due to groundwater overdraft ranged from one to 24 feet between 1926 and 1972 (U.S. Geological Survey (USGS), 1988).

Surface water deliveries from the San Luis Unit (SLU) began in 1968 and largely replaced groundwater for irrigation. However, extensive pumping occurred in 1977, a drought year when deliveries of CVP water amounted to only 25 percent of the District's entitlement. In response to the surface water shortfall, farmers reactivated old wells and constructed new wells, pumping groundwater to irrigate their crops. During 1977, groundwater pumping rose to nearly 500,000 AF and the piezometric surface declined about 90 feet, resulting in localized subsidence of about 4 inches according to USGS officials.

Groundwater pumping increased to about 300,000 AF in 1989-90 because of decreased CVP water supplies caused by the drought. Pumping during 1990-91 and 1991-92 estimated to be about 600,000 AF annually. This increase in pumping has resulted in a piezometric water surface decline of about 91 feet from 1988 through 1991, but had recovered by 1997.

A study by the Bureau, USGS, and Westlands estimated the safe yield of the deep confined aquifer underlying Westlands to be between 100,000 and 135,000 AF annually (Westlands Water District, 1980). Westlands does not supply groundwater to District farmers nor does the District regulate or control groundwater pumping; individuals pump their own

groundwater. The District however, does survey the static water levels in the wells and the water quality and quantity of the pumped groundwater, as part of the Groundwater Management Plan completed under provisions of AB 3030 in 1996, see Appendix E. More recent district analyses of these data indicate that a better-estimated safe yield may be between 135,000 and 200,000 AF.

The irrigable area, amount of Project water and groundwater used each crop year shown in Table 8.

Table 8: District Water Supply (Water Year)

Crop Year[14]	Irrigable Area Ac	Project Water AF	Transfer AF	Ground Water[15] AF	Total AF
1978	566,475	665,895	0	159,000	824,895
1979	565,917	1,084,386	0	140,000	1,224,386
1980	564,719	1,138,994	0	106,000	1,244,994
1981	563,301	1,244,446	0	99,000	1,343,446
1982	564,039	1,236,639	0	105,000	1,341,639
1983	567,184	1,090,888	0	31,000	1,121,888
1984	568,197	1,473,883	0	73,000	1,546,883
1985	568,554	1,315,548	0	228,000	1,543,548
1986	568,986	1,194,113	0	145,000	1,339,113
1987	566,844	1,309,252	0	159,000	1,468,252
1988	568,083	1,258,384	11,829	160,000	1,430,213
1989	567,817	1,136,714	21,194	175,000	1,332,908
1990	568,389	808,978	111,703	300,000	1,220,681
1991	568,470	282,957	93,776	600,000	976,733
1992	570,552	262,044	113,491	600,000	975,535
1993	567,390	444,237	221,664	225,000	890,901
1994	563,563	662,672	196,820	325,000	1,184,492
1995	563,781	729,238	189,405	150,000	1,068,643
1996	563,881	1,136,625	267,340	50,000	1,453,965
1997	563,900	1,005,434	326,939	30,000	1,462,373
1998	564,053	798,604	211,724	15,000	1,025,328
1999	564,271	1,088,644	204,226	60,634	1,353,504
2000	564,191	438,850	438,850	225,000	1,079,153
2001	564,274	688,505	178,437	215,000	1,081,942
2002	564,154	620,298	149,846	220,000	975,144
2003	563,633	849,126	134,781	160,000	1,143,907
2004	560,670	780,899	137,697	210,000	1,128,596
2005	560,547	796,138	170,423	75,000	1,041,561
2006	559,744	1,044,824	78,257	25,000	1,148,081
Average	565,365	920,249	170,256	174,160	1,264,664

Other Water Supplies

On a year-by-year basis flood flows from the San Joaquin and Kings Rivers are available to Westlands. These water supplies flow into the Mendota Pool on a seasonal basis and are available to the District through the 7-1 Pumping Plant. No water was taken from this source in the 1996-97 Water Year. The upper limit, due to pumping plant limitations, of water delivered from this source would be approximately 20,000 AF.

[14] October 1 to September 30.

[15] A District estimate starting with 1988 crop year.

Restrictions on the District's Water Sources

Westlands long term outlook for project water deliveries shows an expectation of about 70 percent of contract delivery, while the most recent years have seen near full contract deliveries due to abundant precipitation conditions experienced in California.

Restriction	Restriction	Effect on District Operations
District is not receiving its full-contract supply because of implementation of the CVPIA.	Department of Interior, U.S. Bureau of Reclamation.	The CVPIA reallocated 800,000 of the CVP yield away from traditional uses for environmental purposes. It is not clear yet whether this amount of water can be ñdouble-countedò and serve both restoration purposes as well as those required under the ESA, as it should. It also is not clear whether this water can be used more than once, i.e., used for temperature control upstream, but still be available for pumping to users south of the Delta, again, as it should.
District is not receiving its full contract supply because of implementation of the ESA.	Department of Interior, Fish and Wildlife Service; Department of Commerce, National Marine Fisheries Service.	Because of the listing of the winter-run Chinook salmon and the Delta smelt, as well as the potential listing of several other native species, Project operations have been drastically altered to meet requirements of the ESA. Consequently, to date, both Services have chosen to sharply restrict pumping at both the state and federal pumps in the southern Delta as their only course of implementation. This has resulted not only in a reduction of water supplies, but also has created an unfair and inequitable burden on those users south of the Delta.
District may not receive its full contract supply because of proposed water quality and salinity standards in the Delta.	U.S. Environmental Protection Agency (EPA).	With the EPA announcing proposed standards, it is unclear exactly what the impact will be. However, it is clear that there will be an impact, both in terms of water supply reductions and water costs. It will be some months before the precise effects can be quantified.
Court ordered reductions in pumping because of the operations of the CVP and SWP might cause the extinction of the Delta Smelt.	U.S. District Court for the Eastern District of. California	The reduction in pumping ordered by the Court will result in addition water supplies shortages. As a result, it will be necessary to fallow more land, with associated impacts on farm workers, Westside communities, and other public agencies.

Source Water Quality Monitoring Practices

The District does not deliver any potable or treated water. Water is delivered directly from the California Aqueduct or the Mendota Pool on the San Joaquin River. Any requirements for drinking water uses of the water are the water userôs responsibility; the water quality monitoring is accomplished by the individual water user. In general, biological monitoring and treatment are a necessity for any public water supplier.

Several sources for raw water quality are available to District water users:

1. Non-agricultural water users, to satisfy requirements of the Safe Drinking Water Act, use information from a Raw Water Representative Sampling Program. This program provides annual Title 22 sampling and analysis at 10 locations in the District during August. The results are reported to all non-agricultural water users and the Fresno County Department of Health Services. Similar analysis is obtained when water is pumped from the Mendota Slough.

2. The Distribution Integration Program allows a water user to pump groundwater into the district distribution system that meets drinking water standards. Verification sampling is conducted when this program is in operation.

3. The District receives monthly Water Quality Reports from Checks 13, 18, and 21 on water delivered from the California Aqueduct. These reports document electrical conductivity (EC), Temperature and Turbidity on an hourly basis.

4. The annual groundwater-monitoring program conducted under the Groundwater Management Plan analyzes water from running wells in December for EC. The results are consolidated into a District groundwater quality map for the Groundwater Management Plan.

Crop Production

Westlandsô farmers work some of the most fertile and productive land in the world, producing vital food and fiber products and economic wealth from renewable natural resources. More than 60 different crops are grown commercially in the District with the potential for scores of others. In addition, unlike many other key growing areas of California, urbanization is not a direct threat to productivity.

Westlandsô farmers have combined generations of family tradition with state-of-the art advances in modern agricultural practices. They provide California and the United States an irreplaceable asset producing the three-way benefit of (1) superior crop yields, (2) high crop value, and (3) low water use.

The Crop Acreage Report, Table 9, lists the acreage devoted to each crop, the average yield, and the crop value produced. Crop Acreage Trends from 1978-2006 are shown in Tables 10-13. Prior to the delivery of Project water, Westlandsô farmers primarily grew cotton and grain crops, such as wheat and barley, and some vegetables. However, between 1980 and 1996, the acreage devoted to vegetables increased to more than 220,000 acres, while grains declined by some 100,000 acres. Figure 7 shows the acreage of grains, safflower, and vegetable crops grown in the District during this period. Crops classified as grain and vegetable are indicated in Crop Production Reports. Part of the increase in vegetable production is attributed to the fact that

traditional ñsalad bowlò growing areas, such as the Salinas-Monterey area and the Central Coastal counties of California, are becoming urbanized and water scarce. In addition, some coastal areas are faced with groundwater pumping limitations brought about by seawater intrusion.

As the Districtôs farmers devote more resources to raising vegetable crops, (some of which are double-cropped) and to growing more than 34,000 acres of trees and vines, they are recognizing the need to produce growing high-quality marketable products that meet the consumer's increasingly high standards. Therefore, in addition to meeting crop water requirements for normal growth, significant amounts of water are used on plants for cultural practices such as weed control, climate control, holding tomatoes for harvest, and ensuring a tight head of lettuce or swelled garlic bulbs. Because of the continuing changes in water management due to cultural practices, Westlandsô farmers now require more water on acreage where low water use crops, such as wheat and barley, were previously grown.

Table 9: 2006 Crop Acreage Report

Crop	Acres	Crop	Acres[16]
Alfalfa-Hay	13,304	Melons-Mixed	983
Alfalfa-Seed	1,887	Nectarines	425
Almonds	55,180	Oats	4,182
Apples	332	Onions-Dehy	13,597
Apricots	487	Onions-Fresh	4,671
Artichokes	7	Oranges	1,126
Asparagus	726	Parsley	918
Barley	5,647	Pasture	1,027
Beans-Dry	512	Peaches	1,181
Beans-Garbanzo	6,352	Peppers-Misc	2,126
Beans-Jojoba	11	Pistachios	15,130
Beans-Green	158	Plums	368
Blueberries	82	Pluots	16
Broccoli	6,106	Pomegranates	1,814
Cabbage	26	Prunes	220
Cantaloupes	15,580	Safflower	2,594
Carrots-Bulk	320	Seed Crop-Misc.	1,644
Cherries	432	Spinach	282
Corn-Field	2,427	Sugar Beets	4,228
Corn-Sweet	5,778	Tangerines	183
Cotton-Lint-Acala	44,167	Tomatoes-Fresh	5,832
Cotton-Lint-Pima	86,106	Tomatoes-Proc	87,418
Cucumbers	305	Walnuts	407
Eucalyptus	24	Watermelons	1,769
Garlic	10,486	Wheat	35,696
Grains-Sorghum	19,373	NB Trees & Vines[17]	16,036
Grapefruit	68	Fallow	54,944
Grapes-Raisin	461	Non harvested[18]	3,130
Grapes-Table	825		
Grapes-Wine	11,418		
Honeydews	3,270	Subtotal	580,056
Lettuce-Fall	11,221	Double Crop	20,312
Lettuce-Spring	15,818	Total[19]	559,744

[16] USDA-CFSA net cropped acreages.
[17] Non-bearing trees and vines.
[18] Includes experimental and nursery crops.
[19] Total net cropped acreage in Westlands, excluding feedlots, commercial, residential and industrial areas.

Table 10: 1978-1985 Crop Acreage Trends

Crop	1978	1979	1980	1981	1982	1983	1984	1985
Alfalfa-Hay	13,771	13,450	10,182	11,438	6,256	10,887	11,136	10,768
Alfalfa-Seed	17,337	14,162	18,925	15,103	17,552	10,832	15,235	14,486
Almond	6,531	6,991	7,738	8,038	8,116	7,586	7,940	7,959
Apple	63	15	15	18	18	18	17	18
Apricot								122
Asparagus	54					483	412	382
Barley	126,862	78,840	76,547	54,206	45,818	21,004	22,674	24,901
Beans-Dry	1,873	1,090	2,149	2,755	4,033	101	3,872	7,545
Beans-Green	2,370	4,739	3,735	4,730	2,368	7,869		477
Broccoli	38	261	25			259	1,307	2,308
Cantaloupe	19,929	19,467	18,037	16,641	17,237	21,523	21,008	20,190
Carrot			585	120		706	946	1,176
Cauliflower	193	436	100	477			338	155
Corn-Field		598	1,896	152	1,175	980	7,803	7,153
Corn-Silage		595	400	5,133	5,665	171		
Corn-Sweet								871
Cotton-Acala	272,061	300,563	284,688	300,309	277,064	230,307	297,174	286,169
Cucumber				155	106		26	
Garlic	1,856	2,670	3,427	4,602	7,510	9,118	8,132	8,670
Grain-Sorghum/Milo	5,813	555	635	442	2,680	276	1,060	
Grape-Raisin			100	80	77	155		
Grape-Wine	4,566	4,924	4,782	5,603	6,247	5,262	6,767	6,633
Honeydew	100	150				399	348	225
Lettuce-Spring	7,358	8,876	6,123	3,529	3,100	5,870	6,420	8,813
Lettuce-Fall			1,367	3,801	3,391	5,640	1,551	5,879
Nectarine								72
Oats	677				174			255
Olive	423	423	412	423	423	423	423	423
Onion	2,433	4,320	3,803	6,393	8,772	9,070	8,921	9,954
Orange	157	157	157	157	157	157	182	163
Pasture	1,697	227	210	254	501	382	344	261
Peaches								54
Peas-Green	1,157	1,372	1,259	299	617	1,535	2,320	231
Pepper-Misc	532	877	972	1,321	1,110	1,498	1,039	1,392
Pistachio	565	584	572	886	2,243	1,968	2,102	2,252
Pomegranate	669	724	722	580	547	473	504	521
Rice	1,080	638	1,649	1,676	435	291	388	37
Safflower	9,393	14,550	9,982	7,219	10,507	9,573	8,161	3,846
Seed Crop-Misc	631	1,098	412	467	665	106	2,584	434
Sugar Beet	6,746	6,746	9,901	11,194	11,455	7,046	5,203	5,699
Tomatoes	30,224	37,504	27,857	29,656	45,000	56,949	59,817	54,211
Walnut	38	21	82	133	124	137	33	150
Watermelons								63
Wheat	1,591	16,051	55,637	60,507	52,528	49,045	50,314	49,989
N/B Trees/Vines		533	275	128	617	1,286	15	558
Fallow-Idle Land	36,335	25,743	16,527	18,203	26,128	93,773	16,340	30,579
Non-Harvested		609	347	707	3,278	1,464	773	3,245
Miscellaneous	129	405		167	242	931	871	352
Subtotal	**575,496**	**574,119**	**573,525**	**576,497**	**578,889**	**578,721**	**574,729**	**582,401**
Double Crop	<9,021>	<8,202>	<8,806>	<13,196>	<14,850>	<11,537>	<6,532>	<13,847>
Total	**566,475**	**565,917**	**564,719**	**563,301**	**564,039**	**567,184**	**568,197**	**568,554**

Table 11: 1986-1993 Crop Acreage Trends

Crop	1986	1987	1988	1989	1990	1991	1992	1993
Alfalfa-Hay	10,134	8,738	10,042	8,738	10,042	7,812	5,350	3,958
Alfalfa-Seed	19,130	17,839	14,321	13,453	13,049	8,942	6,297	3,896
Almond	8,301	7,972	7,363	8,381	7,159	8,016	11,817	11,843
Apple	14	70		411	360	554	1,095	1,348
Apricot	122	135	151	172	236	236	301	326
Asparagus	382	443	477	642	547	744		
Barley	22,996	12,866	10,678	15,953	8,587	3,094	10,297	8,226
Beans-Dry	6,074	3,740	8,691	10,052	4,382	2,958	6,836	3,112
Beans-Garbanzo								5,785
Beans-Green		2,282		2,070	3,004	408	231	1,810
Beans-Jojoba		10	10	11	11	11	11	11
Broccoli	4,130	6,413	5,137	2,175	1,003	2,180	2,733	3,209
Cantaloupe	25,345	23,152	18,603	21,310	20,402	17,489	15,997	19,775
Carrot	1,990	2,412	2,749	1,930	1,262	760	638	1,078
Cauliflower	229	435	1,136	170		473	71	150
Cherries								20
Corn-Field	6,926	791	94		665			
Corn-Silage			70					
Corn-Sweet	2,757	3,471	1,900	1,977	973	899	1,082	1,793
Cotton-Acala	231,142	266,483	290,062	241,995	235,290	177,102	195,658	213,057
Cotton-Pima					5,786	30,840	29,237	27,806
Cucumber		20			234		80	80
Eggplant								10
Eucalyptus				53	280	57	2	54
Garlic	9,011	11,583	11,345	12,338	14,500	14,466	14,647	16,239
Grain-Sorghum/Milo	323							
Grape-Raisin		40		61	131		109	255
Grape-Table	155	70	248	314	253	337	309	345
Grape-Wine	6,208	6,306	5,548	5,446	5,483	5,208	5,072	5,587
Honeydew	624	1,881	1,198	1,582	1,825	1,840	1,323	1,758
Lettuce-Spring	7,308	8,107	10,037	9,497	8,602	3,725	8,747	8,610
Lettuce-Fall	6,118	6,496	6,075	5,734	4,209	5,588	9,021	6,130
Nectarine	242	171	193	193	248	197	174	342
Oats	942		446	1,853				
Olive	422	413	413	413	583	471	549	421
Onion	11,357	12,230	12,704	12,839	11,442	8,835		
Onion-Dehy							6,749	8,453
Onion-Fresh							1,510	1,868
Orange	168	167	167	190	207	158	168	213
Pasture	355	540	631	1,697	474	711	485	927
Peaches	20		20	126	190	283	428	292
Peas-Green	301			2,009	1,109	1,039	55	
Pepper-Misc	2,320	2,202	2,253	547	993	917	1,640	1,433
Pistachio	2,534	3,215	2,403	3,365	3,120	4,715	3,892	4,153
Pomegranate	499	542	594	700	797	707	750	830
Plums								130
Prune							169	149
Rice	153	84						
Safflower	13,447	4,127	4,776	8,531	13,541	4,424	19,055	15,356
Seed Crop-Misc	543	745	1,196	1,448	1,234	1,395	670	554
Sugar Beet	11,880	9,730	8,337	7,806	7,393	3,182	5,045	6,445
Tomatoes	60,816	60,095	65,040	80,903	95,159	100,707		
Tomatoes-Fresh							2,959	3,335
Tomatoes-Proc.							75,811	74,964
Walnut	248	252	250	252	264	309		
Watermelons	390	109	25	65	120	278	310	304
Wheat	36,118	26,595	24,641	23,399	26,407	8,399	12,628	14,428
N/B Trees/Vines	821	236	2,497	1,647	6,361	5,423	1,593	2,773
Fallow-Idle Land	67,829	66,236	45.632	64,579	52,544	125,082	112,718	90,413
Non-Harvested	821	449	1,578	743	4,530	6,673	3,638	1,449
Miscellaneous	931	1,328	1,663	1,459	1,118	3,947		
Subtotal	**582,039**	**580,678**	**580,659**	**579,738**	**575,458**	**570,442**	**580,666**	**576,529**
Double Crop	<13,053>	<13,834>	<12,576>	<11,921>	<7,069>	<1,972>	<10,114>	<9,139>
Total	**568,986**	**566,844**	**568,083**	**567,817**	**568,389**	**568,470**	**570,552**	**567,390**

Table 12: 1994-2001 Crop Acreage Trends

Crop	1994	1995	1996	1997	1998	1999	2000	2001
Alfalfa-Hay	4,775	3,815	3,525	4,626	10,550	15,250	13,304	9,701
Alfalfa-Seed	4,600	6,825	6,531	6,326	12,393	14,110	8,915	2,214
Almond	12,202	13,877	14,561	22,039	24,401	28,103	29,178	31,683
Apples	972	1,118	1,445	1,628	1,568	1,102	1,127	707
Apricots	308	490	341	638	638	644	604	598
Artichoke						15	32	26
Asparagus	709	735	803	880	1,246	822	866	655
Barley	6,632	5,423	3,843	3,775	7,076	5,609	6,851	15,100
Beans-Dry	2,148	2,633	2,786	5,003	4,585	4,590	1,106	589
Beans-Garbanzo	9,091	10,539	15,245	6,588	3,524	7,277	8,082	8,320
Beans-Green		820	294	436	2,019	2,924	1,247	629
Beans-Jojoba	11	11	11	11	11	11	11	11
Broccoli	2,761	3,337	3.332	5,528	4,618	7,256	2,412	3,394
Cabbage	203	26	141	164	138	428	27	165
Cantaloupe	20,873	18,998	18,452	19,078	18,405	17,924	18,193	14,025
Carrot	332	606		256	371	1,168	328	283
Cauliflower				15	101	30	29	43
Cherries	20	40	40	101	80	82	123	143
Corn-Field		114	1,138	1,895	1,509	584	694	395
Corn Nuts							179	145
Corn-Sweet	1,875	1,461	2.018	3,786	4,595	5,289	4,240	3,621
Cotton-Acala	214,314	226,601	214,579	203,375	138,118	127,340	180,141	98,354
Cotton-Pima	25,315	42,105	57,782	59,889	74,729	75,860	28,024	90,215
Cucumber		127	104	162	40	78	214	204
Eucalyptus	46	21	24	46	76	42	59	53
Garlic	18,419	21,469	22,665	20,724	23,567	22,820	14,064	15,146
Grain-Sorghum/Milo			684	75	434	279	1,259	19,293
Grape-Juice			491					
Grape-Raisin	155		77		155			
Grape-Table	544	700	661	690	795	730	1,014	1,005
Grape-Wine	4,847	5,479	5,095	7,030	7,857	8,559	8,776	9,111
Honeydews	2,099	2,706	2,483	3,107	2,025	2,284	1,732	2,513
Lettuce-Spring	9,751	9,079	10,708	10,387	11,040	14,323	13,691	13,911
Lettuce-Fall	7,967	9,369	6,438	8,892	12,469	11,830	20,453	9,225
Melons-Mixed	492	1,340	976	845	806	746	642	658
Nectarine	149	148	108	118	30	30	32	30
Oats	153	505	96	655	1,313	493	284	371
Olive	312	487	504	312	312	312	312	312
Onion-Dehy	10,124	8,516	8,706	10,184	12,052	11,792	10,471	8,647
Onion-Fresh	2,458	2,183	1,883	2,094	2,285	12,956	2,410	3,232
Orange	156	156	156	216	216	325	216	216
Parsley			70	25		421	421	412
Pasture	298	604	2,009	748	2,425	1,396	1,554	1,739
Peaches	367	334	374	315	263	223	226	223
Peas-Green		1,237		120				
Pecan				14	72			
Pepper-Misc	1,169	1,597	2,229	1,168	1,310	2,193	1,747	1,790
Pistachio	3,861	4,399	5,747	7,202	7,170	5,040	5,238	9,333
Pomegranate	722	865	904	1,018	1,025	841	1,178	1,234
Potatoes-Sweet							29	
Plums	110							
Prune	75	149	164	149	149	149	149	229
Rice	110							
Pumpkins			20				62	
Radicchio			28	586	54		4	22
Safflower	7,306	8,982	4,925	3,325	3,698	2,567	2,209	4,409
Seed Crop-Misc	381	692	917	728	1,409	1,776	1,610	2,597
Spinach			6	19	51	53		75
Squash	32		3		81			
Sugar Beet	9,539	5,485	4,708	6,624	9,427	7,432	8,543	5,007
Tangerines		50	50	50	50	50	50	50
Tomatoes-Fresh	4,220	4,375	4,484	4,508	3,766	3,660	3,235	3,209
Tomatoes-Proc.	85,768	83,693	88,095	80,671	85,881	95,578	95,085	81,913
Walnut	340	260	506	443	466	435	459	356
Watermelons	349	350	758	1,064	1,279	1,528	1,399	1,454
Wheat	12,207	13,334	20,316	24,805	39,536	23,884	28,436	35,150
N/B Trees/Vines	3,201	2,576	3,327	3,210	4,041	4,420	6,577	4,359
Fallow-Idle Land	75,732	43,528	26,754	35,554	33,481	37,206	47,595	73,807
Non-Harvested	2,170	678	566	584	747	695	850	565
Subtotal	**572,723**	**575,160**	**576,458**	**581,672**	**578,790**	**583,053**	**577,446**	**577,590**
Double Crop	<9,160>	<11,379>	<12,577>	<17,772>	<14,737>	<18,782>	<13,255>	<12,783>
Total	**563,563**	**563,781**	**563,881**	**563,900**	**564,053**	**564,271**	**564,191**	**564,807**

Table 13: 2002-2006 Crop Acreage Trends

Crop	2002	2003	2004	2005	2006
Alfalfa-Hay	13,150	12,307	10,684	9,205	13,304
Alfalfa-Seed	1,460	336	1,116	2,493	1,887
Almond	33,134	37.554	40,102	48,325	55,180
Apples	467	387	291	185	332
Apricots	525	535	473	524	487
Artichoke	27				7
Asparagus	671	620	462	587	726
Barley	7,634	7,199	5,587	12,033	5,647
Beans-Dry	1,093	949	822	565	512
Beans-Garbanzo	4,065	1,140	1,843	4,116	6,352
Beans-Green	386	250	1,447	717	158
Beans-Jojoba	11	11	11	11	11
Broccoli	4,849	5,048	7,258	7,210	6,106
Cabbage	39				26
Cantaloupe	14,260	16,713	17,712	19,482	15,580
Carrot	40	300	367	777	320
Cauliflower	15		79		
Cherries	212	252	237	388	432
Corn-Field	1,066	442	431	1,016	2,427
Corn Nuts	160				
Corn-Sweet	5,254	5,931	5,897	5,425	5,778
Cotton-Acala	101,310	121,853	102,242	74,718	44,167
Cotton-Pima	60,727	37,621	68,875	71,009	86,106
Cucumber	472	473	431	388	305
Eucalyptus	51	51	24	97	24
Garlic	17,039	18,465	16,166	9,463	10,486
Grain-Sorghum/Milo	960	99	1,499	4,272	19,293
Grapefruit	38	38	38	38	68
Grapes-Juice		180			
Grape-Raisin	145	185	801	916	461
Grape-Table	899	1,235	732	512	825
Grape-Wine	8,281	6,789	6,725	9,425	11,418
Honeydew	3,002	2,949	2,268	3,861	3,270
Lettuce-Fall	10,473	10,367	9,513	12,717	11,221
Lettuce-Spring	15,059	13,482	14,563	14,599	15,818
Melons-Mixed	460	573	1,072	539	983
Mustard	198	179	307	101	
Nectarine	190	90	224	358	425
Oats	3,400	1,665	23	3,431	4,182
Olive	312				
Onion-Dehy	10,301	9,148	9,405	11,076	13,597
Onion-Fresh	2,869	3,824	3,753	4,638	4,671
Oranges	248	216	216	791	1,126
Parsley	317	710	456	158	918
Pasture	1,560	1681	559	2,357	1,027
Peaches	971	1,133	1,574	1,108	1,181
Peas-Green				6	
Pepper-Misc	1,214	1,578	2,297	1,989	2,126
Pistachios	7,429	11,158	9,868	11,880	15,130
Pomegranate	1,372	1,481	1,653	1,739	1,814
Plums	144	144	264	342	368
Pluots					16
Prunes	149	149	223	223	220
Pumpkins	7				
Radicchio		63			
Safflower	3,956	2,236	200	1,321	2,564
Seed Crop-Misc	1,747	1,172	2,066	917	1,644
Spinach	75	305	252	60	282
Squash			26	54	
Sugar Beet	5,083	4,984	4,719	4,766	4,228
Tangerines	50	50	183	183	183
Tomatoes-Fresh	2,815	4,528	3,255	4,695	5,832
Tomatoes-Proc.	90,390	88,048	92,395	80,842	87,418
Walnut	357	411	407	405	407
Watermelons	1,316	1,710	2,205	1,785	1,769
Wheat	34,179	57,844	43,384	48,591	35,037
Vetch		145			
N/B Trees/Vines	6,363	2,018	7,233	11,306	16,036
Fallow-Idle Land	94,572	76,654	70,367	66,804	54,944
Non-Harvested	553	1,722	1,461	1,435	3,130
Subtotal	**579,645**	**579,380**	**578,743**	**578,982**	**580,056**
Double Crop	<15,491>	<15,747>	<18,073>	<18,515>	<20,312>
Total	**564,154**	**563,633**	**560,670**	**560,547**	**559,744**

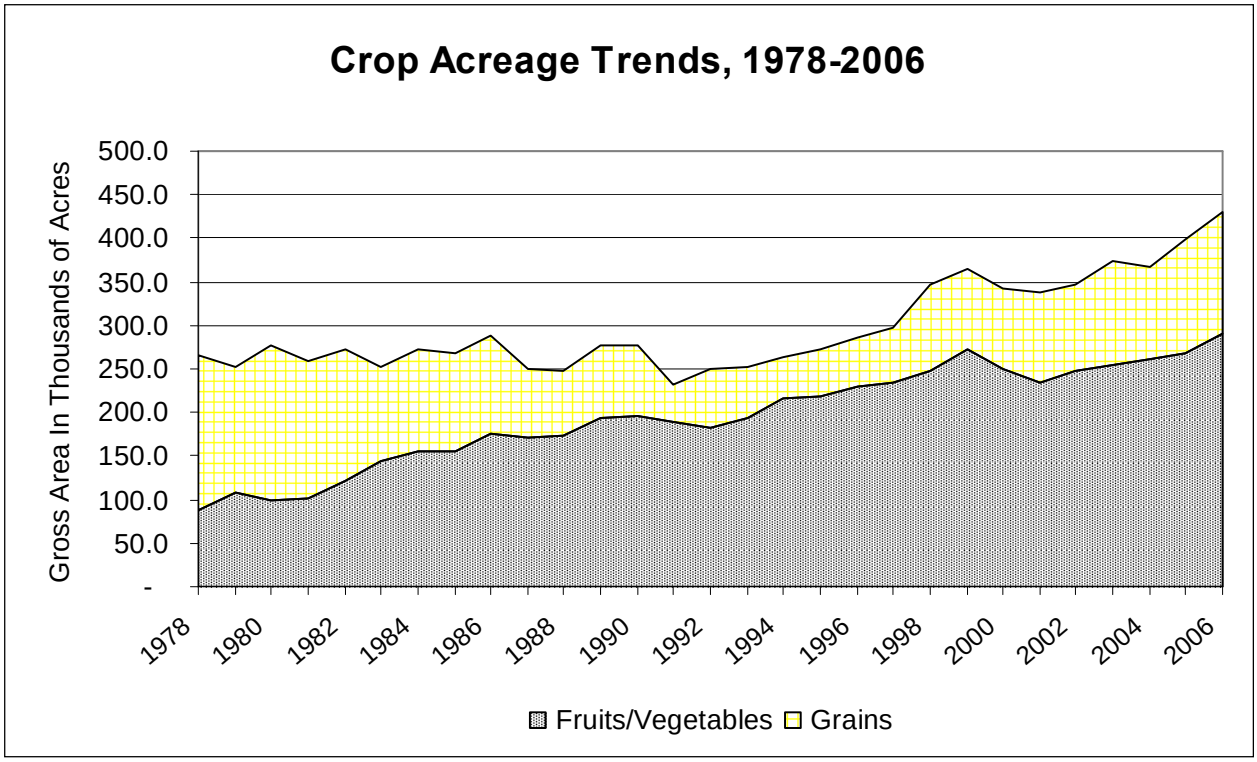

Figure 7: Grains and Fruits/Vegetables Acreage Trends.

Figure 8 shows the variable planting, growing, and harvest seasons and historical seasonal evapotranspiration (ET) of the major crops grown in Westlands during the year. This figure shows that the growing season is year round. Therefore, no single fixed annual crop-water use requirement can be established for the same crop that may be planted and harvested several different times during the year or used for different purposes. Examples are fresh market corn, grain, or silage; fresh market or processing tomatoes; onions and garlic for fresh market or dehydration; and various vegetables planted in either the spring or fall.

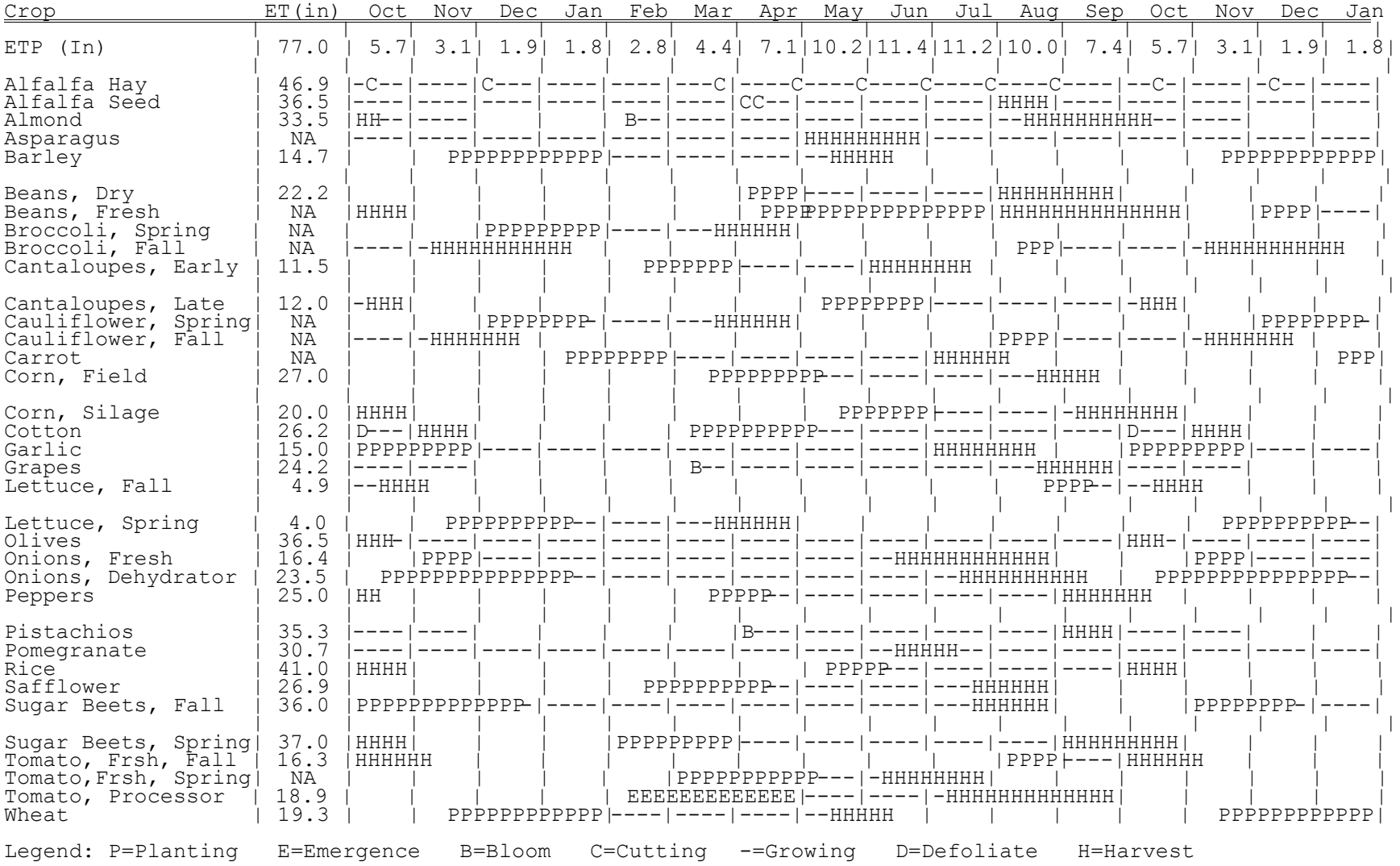

Figure 8: Crop Planting, Growing and Harvest and Historical Seasonal ET.

On-Farm Irrigation Systems

Each year District farmers are surveyed to determine the types of irrigation systems used during the crop year as part of the annual crop-production report survey. Several trends become apparent when this information is compared to a similar survey conducted in 1985, as shown in Table 14. In 1985, 63 percent of the District was irrigated exclusively by surface irrigation (furrow or border strip). In 1990, this figure decreased to 43 percent; in 1996, it decreased to 36 percent; in 2000, it decreased again to 30 percent and by 2006 this figure decreased to 22 percent. The acreage irrigated only by sprinkler systems decreased from 21 to 16 to 15 percent. The acreage irrigated by a combination of sprinkler and furrow almost tripled, from 15 to 43 percent. The drip/trickle acreage from 1985 to 1996, increased from 1 to 6 percent and the drip/trickle acreage from 1996 to 2006, increased from 6 to 36 percent.

Table 14: On-Farm Irrigation Systems

	Percentage of Land Irrigated						
Type of System	1985	1990	1996	2000	2004	2005	2006
Surface							
Furrow	60	38	34	28	23	21	20
Border Strip	3	5	2	2	2	2	2
Combination sprinkler/furrow	15	38	43	43	39	35	31
Pressurized							
Sprinkler	21	16	15	14	11	16	11
Drip/Trickle	1	3	6	13	25	26	36
Total	100	100	100	100	100	100	100

The 1987 through 1989 *Irrigation Improvement Program (IIP)* data were analyzed to determine the use of on-farm tailwater reuse systems in the District. The analysis shows that 62 percent of the 451 fields irrigated by surface irrigation had tailwater systems. This is an increase from 54 percent in the 1985 survey. The 1989 Program data show 16 percent of those fields utilizing tailwater systems returned the water to the same field while only 11 percent of the fields with tailwater systems returned the water to the same field as reported in the 1985 survey.

Various factors may account for these trends. The District has experienced a decrease in its water supply during the drought, which began in 1986. Project water supplies declined by over 100,000 AF annually for the five-year period ending in 1990 when compared to the previous five-year period. In 1990, the District received only 50 percent of its Contract allocation. To cope with these reductions and to continue farming their land, the farmers had to reduce field applications or pump additional groundwater. The pumped groundwater is more expensive than the surface water, and in most cases is of poorer quality.

The *IIP* data indicates sprinkler pre-irrigations followed by regular season furrow irrigations produce the highest irrigation efficiencies. In addition, tailwater reuse systems, when used with furrow irrigation, increased distribution uniformity, thus facilitating better irrigation efficiencies. These findings were shared with the Program participants through their program

advisors and with the rest of the District water users through workshops and Profitable Practices. Undoubtedly, some farmers adopted recommendations from the *IIP* to stretch their supplies in response to supply cutbacks.

Shallow-rooted vegetable crops are difficult to irrigate efficiently with surface systems and are best irrigated by sprinklers during the early portion of the growing season when small applications of water are desirable. Well-managed furrow irrigation will suffice during the remainder of the season, especially on those crops, which are susceptible to mildew caused by mid-to-late season sprinkler irrigations.

The irrigation systems used on the major crops grown in the District are shown in Table 15. High-value, shallow rooted crops such as tomato, garlic, and onion are most likely irrigated by a combination of sprinklers and furrow during the season. Lower-valued, deeper-rooted crops such as alfalfa and wheat are more likely to be surface irrigated. Moderate valued crops such as cotton have about one-half the fields irrigated by sprinklers for at least a portion of the season. Trees and vines such as almonds and grapes tend to be irrigated by pressurized systems and new plantings are almost exclusively drip/trickle irrigated.

Table 15: Crop Irrigation Systems [20]

Crop	Border (%)	Furrow (%)	Sprinkler (%)	Spr/Fur[21] (%)	Drip (%)
Almond		2	14	6	78
Cotton	1	51	16	32	
Garlic		8	12	80	
Melon	2	11	1	85	
Onion-Dehy			59	41	
Onion-Fresh			10	90	
Tomato-Fresh				10	90
Tomato-Process		6	3	90	
Wheat	7	45	28	20	

Water Use
Seasonal Application Efficiency

The Seasonal Application Efficiency (SAE) is the ratio of the crop water requirements to applied water and is used to determine District-wide water use efficiency.

The District-wide SAE averaged 83 percent during the period 1978 through 1996 and is shown in Table 16. The SAEôs vary from a low of 72 percent to a high of 94 percent. The high SAE of 94 percent during the 1978 crop year was due to the high rainfall that occurred during December 1977 through April 1978. This eliminated the need for pre-irrigations and the applied water requirements for all winter crops. Differences in the SAE may be attributed to (1)

[20] A 1997 farmer survey.

[21] Combination of sprinkler and furrow irrigation used during the season.

alternative water management practices and irrigation systems used due to changes in cropping patterns, (2) weather variations, and (3) the increased use of water for the cultural practices required to produce high quality vegetable crops.

Table 16: District-Wide Seasonal Application Efficiency

Crop Year	Area	ET	EP	LRD	CP	CWR	AW	SAE
	Ac	*AF*	*AF*	*AF*	*AF*	*AF*	*AF*	*Percent*
1978	566,475	1,038,432	313,759	40,260	10,000	774,933	824,895	94
1979	565,917	1,063,783	43,781	56,667	10,000	1,086,669	1,224,386	89
1980	564,719	1,110,665	80,939	57,207	10,000	1,096,933	1,244,994	88
1981	563,301	1,200,511	48,200	64,017	10,000	1,226,328	1,343,446	91
1982	564,039	1,092,494	44,669	58,213	10,000	1,116,038	1,341,639	83
1983	567,184	991,794	67,654	51,341	11,000	986,471	1,121,888	88
1984	568,197	1,219,669	36,124	65,753	11,000	1,260,298	1,546,883	81
1985	568,554	1,137,106	30,286	61,485	12,000	1,180,305	1,543,548	76
1986	568,986	1,063,689	95,168	53,807	12,000	1,034,328	1,339,113	77
1987	566,844	1,050,545	47,952	55,700	13,000	1,071,293	1,468,252	73
1988	568,083	1,095,899	55,181	56,702	13,000	1,110,420	1,430,213	78
1989	567,817	1,063,991	65,249	54,468	14,000	1,067,210	1,332,908	80
1990	568,389	1,062,302	74,386	49,100	14,000	1,051,016	1,220,681	85
1991	568,470	930,480	110,554	43,063	14,000	876,989	976,733	90
1992	570,552	942,959	151,541	39,011	14,000	844,429	975,535	87
1993	567,390	958,847	241,475	35,932	14,000	767,304	890,901	86
1994	563,563	970,136	47,225	37,839	15,351	976,101	1,184492	82
1995	563,781	993,328	179,851	28,766	15,823	858,066	1,068,642	80
1996	563,881	1,157,630	79,587	41,311	15,999	1,135,353	1,453,965	78
1997	563,900	1,102,236	115,158	33,119	16,372	1,036,659	1,362,373	76
1998	564,053	937,140	120,361	28,683	18,136	863,598	1,025,328	84
1999	564,271	1,005,086	5,479	39,286	19,894	1,058,787	1,312,870	81
2000	564,191	946,163	30,018	39,286	18,576	974,007	1,079,153	90
2001	564,274	923,675	87,443	40,492	16,622	893,345	1,081,942	83
2002	564,154	894,311	38,547	45,032	18,376	919,172	990,144	93
2003	563,633	913,403	65,014	35,250	18,032	901,671	1,143,907	79
2004	560,670	931,390	66,493	36,040	18,040	918,977	1,128,596	81
2005	560,547	917,765	77,917	35,823	16,339	892,010	1,066,561	84
2006	559,744	1,084,203	219,045	32,723	18,084	915,965	1,148,081	80
Average	565,365	1,027,576	91,002	45,392	14,401	996,368	1,202,485	83

The difference between the amount of applied water and the amount of crop water requirement is the water loss due to all factors. This loss can be attributed to both on-farm distribution and irrigation system losses. Individual on-farm irrigation system losses will depend upon the type of irrigation system. These losses can generally be classified into two categories, evaporation and deep percolation. Deep percolation is water that infiltrates into the soil but becomes unavailable for crop use because it moved below the root zone. Deep percolation on all District irrigable land averaged about 0.46 feet during the period 1978 through 2006 as shown in Table 17. The depth of deep percolation shown in Table 18 is about 10 percent less than the depth that would occur when only the land actually irrigated is considered.

Data from Westlandsô 1987-89 *Irrigation Improvement Program (IIP)* (described later) shows that deep percolation is about 0.1 foot in areas where the shallow groundwater is less than 6

feet below the soil surface. This is substantially less than the San Joaquin Valley Drainage Programôs recommended goal.

Table 17: District Deep Percolation

Crop Year	Irrigable Area	Applied Water	ML+CP	ET	EP	ETAW	Deep Percolation	
	Ac	*AF*	*AF*	*AF*	*AF*	*AF*	*AF*	*FT*
1978	566,475	824,895	19,797	1,038,432	313,759	724,673	80,425	0.15
1979	565,917	1,224,386	29,385	1,063,783	43,781	1,020,002	174,999	0.32
1980	564,719	1,244,944	29,880	1,110,655	80,939	1,029,726	185,388	0.34
1981	563,301	1,343,446	32,243	1,200,511	48,200	1,152,311	158,892	0.29
1982	564,039	1,341,639	32,199	1,092,494	44,669	1,047,825	261,615	0.49
1983	567,184	1,121,888	26,925	991,784	67,654	924,130	170,130	0.36
1984	568,197	1,546,883	37,125	1,219,669	36,124	1,183,545	326,213	0.59
1985	568,554	1,543,548	37,045	1,137,106	30,286	1,106,820	399,683	0.74
1986	568,986	1,339,113	32,139	1,063,689	95,168	968,521	338,453	0.68
1987	566,844	1,468,252	35,238	1,050,545	47,952	1,002,593	430,421	0.86
1988	568,083	1,430,213	34,325	1,095,899	55,181	1,040,718	355,170	0.68
1989	568,817	1,332,908	31,990	1,063,991	65,249	998,742	302,176	0.60
1990	568,389	1,220,681	29,296	1,062,302	74,386	987,916	203,469	0.39
1991	568,470	976,733	23,442	930,480	110,554	819,926	133,364	0.30
1992	570,552	975,535	23,413	942,959	151,541	791,418	160,704	0.35
1993	567,390	890,901	21,382	958,847	241,475	717,372	152,147	0.32
1994	563,563	1,184,492	28,428	970,136	47,225	922,911	233,153	0.48
1995	563,781	1,068,642	25,647	993,328	179,851	813,477	229,518	0.44
1996	563,881	1,453,965	34,895	1,157,630	79,587	1,078,043	341,027	0.63
1997	563,900	1,362,373	32,697	1,102,326	115,158	987,168	342,508	0.65
1998	564,053	1,025,328	24,608	937,140	120,361	816,779	183,941	0.35
1999	564,271	1,312,870	31,509	1,005,086	5,479	999,607	281,754	0.53
2000	564,191	1,079,153	25,900	946,163	30,018	916,145	137,108	0.27
2001	564,274	1,081,942	25,967	923,675	87,443	836,231	219,744	0.45
2002	564,154	990,144	23,763	894,311	38,547	855,764	110,617	0.24
2003	563,633	1,143,907	27,454	913,403	65,014	848,389	268,064	0.55
2004	560,670	1,128,596	27,086	931,390	66,493	864,897	236,897	0.48
2005	560,547	1,066,561	25,597	917,765	77,917	839,848	201,116	0.41
2006	559,744	1,148,081	27,554	1,084,203	219,045	865,185	255,369	0.51
Average	565,365	1,202,576	28,860	1,025,554	91,002	936,574	237,051	0.46

Distribution Uniformity

The attainable Distribution Uniformity (DU) limits the irrigation efficiency of any irrigation system unless the crop is under irrigated. As its name implies, DU is the measure of how evenly the water is infiltrated into the soil profile. DU is a ratio of the average depth of water infiltrated into the soil in the quarter of the field infiltrating the least amount, to the average depth of total irrigation water infiltrated, in percent:

$$DU = \frac{Infiltration, AverageLowQuarterDepth}{Infiltration, AverageFieldDepth} X100$$

This method of determining DU based on the low quarter infiltration depth was

developed by the U.S. Department of Agriculture, Soil Conservation Service and has become the standard for comparing alternative conditions (ASAE, 1980). It should be emphasized that this equation does not account for the possibility that one-half of the low quarter, or 12.5 percent of the field, could be under irrigated. These results in inadequate leaching and a reduction in crop yield in this part of the field.

When an irrigation system operates at 80 percent DU, a farmer needs to apply an additional 25 percent of crop water requirement to adequately irrigate those parts of the field to which the system infiltrates the least amount of water. This over application results in losses to deep percolation below the crop root zone. A farmer can improve the system's DU through proper design and management, but no irrigation system's efficiency can exceed its attainable DU unless the field is intentionally under irrigated which reduces crop yields.

Average DU values for various irrigation systems measured by field evaluations, along with estimates of potential DU, are shown in Table 18. The table includes DU values for Westlands compiled from the 1987-1989 IIP; 2003-2006 IIP (Drip/Trickle only) and for drip/trickle irrigation systems evaluated throughout California by the Resource Conservation Districtsô Mobile Laboratory Programs (Little, 1989).

Table 18: Distribution Uniformities

Irrigation System	Potential		Measured		
	Tanji & Hanson (%)	Merriam & Keller (%)	Little (%)	IIP[22] (%)	Attainable (%)
Furrow	85	80	N.A.	79	80
Border	77	77	N.A.	N.A.	80
Basin	92	72	N.A.	N.A.	80
Sprinkler	75	75	N.A.	71	75 [23]
Drip/Trickle	85	82	74	84	80

The potential DU for each irrigation system is based on the mid-point of a range of values provided by Merriam and Keller, 1978, and Tanji and Hanson, 1990. Potential DUôs for each irrigation system will vary from field to field depending on field specific conditions such as topography, soil texture, wind conditions, and water quality. The attainable DUôs that can currently be achieved during the life of the system are based on the best commercial irrigation systems in the District and analysis of the measured DUôs within Westlands. The absolute maximum attainable appears to be 85 percent, and that level would require a significant investment for technology and management to achieve and sustain this level, possibly with micro-irrigation and linear move systems.

After studying the differences in DU for the irrigation systems used in the District, it is evident that there is more variation in DUôs within system categories than between categories. Therefore, it is concluded that proper system design for each field, along with good management, has a greater impact on DU and thus on irrigation efficiency than the type of system being used.

[22] 1987-89 Irrigation Improvement Program (IIP) and 2003-2006 IIP (Drip/Trickle only).

[23] A DU of 80 percent is attainable when alternate sets are used.

It is estimated from 1987-1989 IIP data that the average annual DU for current irrigation systems and management is approximately 74 percent. Irrigation efficiency values greater than the DU are the result of under irrigation; these high irrigation efficiency values occur at the cost of lower yields since parts of the field are under irrigated. The lower irrigation efficiencies noted for crops such as vegetables are due to difficulties in applying the precise amounts of water necessary to refill the shallow root zones.

Future Water Requirements

It is anticipated that cropping patterns in Westlands will change in the future. Current and projected cropping patterns based on trends during the past several years are shown in Table 19. Future cropping patterns will be influenced by (1) decreases in average farm size, (2) increases in water costs, (3) increases in acreage of high-value crops, (4) increases in double cropping, (5) lands taken out of production, (6) substantially reduced subsidies for crops and water, and (7) no fallow acreage. The projected acreages are determined by water need rather than availability.

Table 19: Present and Projected Cropping Patterns

Crop	2006 Present	2020 Future
	Ac	Ac
Alfalfa Hay	13,305	10,000
Cotton	130,886	70,000
Field Crops	87,466	90,000
Grain	35,037	5,000
Trees	75,309	90,000
Vegetables	170,641	200,000
Vines	12,468	15,000
Fallow	54,944	125,000
Subtotal	580,056	605,000
Double Crop	(20,312)	(30,000)
Total	559,744	450,000

The information presented in Table 19 assumes a larger amount of land fallowed in 2020 due to the restriction in flows south of the delta. Some land will be used for alternative purposes and will be voluntarily removed from production. The water currently used on these lands will be used elsewhere within the District.

The projected water requirement for Westlands in the year 2020 is expected to be approximately 1.39 million acre-feet as shown in Table 20. This projection is based on the expectation that irrigation systems will be designed and operated to apply water more frequently, which should improve yields.

Crop ET will increase due to the more frequent irrigations, distribution uniformity will

increase to 85 percent, and alternative water management practices will ultimately allow the seasonal application efficiency to improve to 80 percent without under irrigation. Some newly installed irrigation systems have distribution uniformities greater than 85 percent. However, regardless of the system, it is expected that production agriculture DU will, at best, average no greater than 85 percent over the course of the systemôs service life. Proper management is essential to achieve high efficiencies, even for systems, which have potentially high DU.

The Districtôs firm water supply consists of 1.15 million AF of Project water and 0.15 million AF of groundwater for a total of 1.3 million AF. This supply is about 0.22 million AF less than the amount required by the farmers to keep ahead of the rising costs to produce the food and fiber needed by the state's ever increasing population.

Table 20: 2020 Projected water Requirement

Crop	Area	Evapotranspiration		Effective Precipitation		Leaching* Requirement		Cultural Requirement		Crop Water Requirement		Seasonal Application Efficiency	Water Use	
	Ac	AF/Ac	AF	AF/Ac	AF	AF/Ac	AF	AF/Ac	AF	AF/Ac	AF	Percent	AF/Ac	AF
Alfalfa hay	10,000	5.1	51,000	0.2	2,000	0.3	3,000	0.0	0	5.2	52,000	80	6.50	65,000
Cotton	70,000	2.4	168,000	0.1	7,000	0.1	7,000	0.0	0	2.4	168,000	80	3.00	210,000
Field crops	90,000	2.9	261,000	0.2	18,000	0.1	9,000	0.0	0	2.8	252,000	80	3.50	315,000
Grain	5,000	1.8	9,000	0.2	1,000	0.1	500	0.0	0	1.7	8,500	80	2.13	10,650
Trees	90,000	3.0	270,000	0.2	18,000	0.1	5,000	0.0	0	2.9	261,000	80	3.63	326,700
Vegetables	200,000	1.6	320,000	0.1	20,000	0.1	30,000	0.1	20,000	1.7	340,000	80	2.13	426,000
Vines	15,000	2.3	34,500	0.1	1,500	0.1	1,000	0.0	0	2.3	34,500	80	2.88	43,200
Fallow	125,000	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	80	0.00	0
Subtotal	605,000													
Double crop	(30,000)													
TOTAL	450,000		1,113,500		67,500		50,000		20,000		1,116,500	80		1,396,550

* Five percent of ET

Water and Salt Balance

Water and salt balances are simply defined as the amount of each that enters the root zone and its final destination. Water available for use in the root zone comes from four main sources: effective precipitation, groundwater wells, the San Luis Canal, and the Mendota Pool. Water leaves the root zone by crop evapotranspiration, surface evaporation, and deep percolation. Farmers are prohibited from moving Project water outside the farm or District boundaries without prior approval. Subsurface drainage water is not exported from or imported into Westlands. District and other studies show subsurface lateral inflow and outflow estimates to be nil and will not be considered in the water balance calculation. In addition, a small amount of shallow groundwater may be present in the root zone. This is not considered a renewable water source since once it is used; it can only be replaced by subsequent over-irrigation.

Since its inception, Westlands has been analyzing its irrigation water use. Water use, measured at each delivery, is compiled on an annual basis. Annual estimates of groundwater pumped have been provided by the U.S. Geological Survey, and more recently verified by the District's in-house groundwater monitoring program. District-wide crop evapotranspiration is calculated using computer models, which are field, verified with soil moisture data measured with a neutron probe. Effective precipitation is calculated from rainfall data collected at three weather stations. Leaching Requirement Depth (LRD) is the quantity of water required to leach salts below the crop root zone to maintain crop production.

The seasonal application efficiency is estimated for each crop year. After minor evaporative losses are considered, the quantity of water that percolates below the root zone is also estimated.

Water Balance

The water balance equation states that the sum of the water brought into the root zone, minus the sum of the water taken out of the root zone, must be equal to the change in storage of water. Since no Project water is taken out of the District, evapotranspiration, evaporation, and deep percolation are assumed the ultimate destination of all applied water.

Applied water is primarily surface water, supplemented by pumped groundwater. Pumped groundwater for 2006, the most recent year was 100 percent of the Contract water supply was available was 25,000 AF. The ET, leaching component of deep percolation, and water for cultural practices are considered to be of beneficial use. The deep percolation, in excess of the LRD, considered lost since and cannot be recovered for reuse because most of Westlands overlies saline shallow groundwater.

Table 21 shows the Districtôs average water balance in the root zone for the period 1978 through 2006, using data from tables 9, 17, and 18.

Table 21: Average Root Zone Water Balance[24]

	Inflow (AF)	Outflow (AF)
Project Water	1,077,074	
Effective Precipitation	91,002	
Pumped Groundwater	172,444	
Crop ET		1,027,576
Evaporation (ML + CP)		28,860
Deep Percolation (includes LRD)		282,443
	1,340,520	1,338,879

Shallow groundwater observations are made in April and October of each year for east side of the District. These indicate a stable situation and only minor changes in water storage. Fluctuations in shallow groundwater levels indicate that local over-irrigation in or immediately adjacent to a field, rather than lateral subsurface flow, is the main cause of changes during the irrigation season.

Salt Balance

A root zone salt balance is achieved when the amount of salts added to the root zone and the amount removed by leaching are equal. The inflow of salts to the root zone in Westlands from irrigation with Project water and groundwater is presented in Table 22.

Table 22: Root Zone Salt Balance

	Inflow		Outflow
Project Water[25]	454,000	Tons	
Groundwater[26]	251,000	Tons	
Fertilizers and Amendments	Unknown		
Deep Percolation			Unknown
Total	Unknown		Unknown

The generalized buildup of salts in Westlandsô soil cannot be determined using standard procedures such as those described in Food and Agricultural Organization, Irrigation and Drainage Paper No. 29, Water Quality for Agriculture. These procedures assume the average salts in the applied water are equal to the average amount leached from the root zone. Such steady state conditions seldom exist. Furthermore, when this procedure is applied to a district or region, the average or steady state salt inflow/outflow can appear to be in balance, while leaching remains inadequate or excessive in specific localities. Inadequate leaching results in excessive root zone salinity and reduced crop production. Excessive leaching can result in increased deep percolation and rising shallow groundwater levels, which can also reduce crop production.

[24] Average of 1978 to 2006 Water Years.
[25] Average Project Water EC=0.43 dS/m for 1978-2006.
[26] Average Groundwater EC=2.0 dS/m.

Westlandsô actual root zone salt balance cannot be calculated because salts from mineral dissolution, soil amendments, and fertilizers are unknown as is the salt removed from the root zone by deep percolation and added from fluctuating shallow groundwater levels.

In addition, 1976 research by Drs. Kaddah and Rhoades identified the difficulty with attempting to determine district-wide salt balance of an irrigation district. Their work in the Imperial Valley indicates that naturally occurring salts laid down during soil formation still have a significant effect on salinity and salt balance distribution. Specific field leaching values were also difficult to identify because typical leaching fraction analysis assumes a steady state condition of root zone salinity. In this condition, only those salts added to the field are concentrated and removed through deep percolation without considering other salt inputs or outflows.

Municipal and Industrial Uses

Municipal and Industrial (M&I) water uses are provided from the basic agricultural contract, under provisions that allow for M&I uses. True M&I uses should be differentiated from incidental agricultural uses. Incidental agricultural uses, provided for in the contract, are those on-farm support uses that are necessary to the conduct of agricultural activities, such as dust control on roads, wash racks, and water for on farm-water treatment plants. True M&I uses are those non-agricultural production uses within the District that support agricultural production, but are not on-farm operations, such as cotton gins, tomato processing plants, motels and restaurants. Westlands provides conveyance services to cities and governmental agencies, but does not provide any treated water.

Groundwater Recharge

Westlands does not have any groundwater recharge facilities within the District. Except for the western portion of the district, Westlands is generally considered to be sitting above a saline salt sink, the upper unconfined aquifer or shallow groundwater. Recharge for the lower confined aquifer comes generally from east of the District, below the Corcoran clay. Recharge of the confined aquifer might possibly occur in areas on the western edge of the District, near the coast range, where the boundary of the Corcoran clay is irregular.

Water Transfers

Water transfers have become an important component in Westlands water supply. Transfers from other districts are pursued each year to supplement reduced contract deliveries when the price is reasonable. Transfers within the District are used to supplement a water userôs allocation from supplies currently available. Table 23 has a consolidated list of transfers into Westlands from other districts in the 2006-07 Water Year. Due to the shortage of supply, no water is transferred out of Westlands.

Table 23: Consolidated Transfer List
Water Year 2006-07

	Transferred	
Agency	In (AF)	Out (AF)
Byron Bethany ID	6,900	
Byron Bethany ID	2,000	
Del Puerto WD	654	
Del Puerto WD	1,000	
Del Puerto WD	100	
Del Puerto WD	1,000	
Del Puerto WD	1,000	
Kings River Water Association	6,672	
Panoche WD	5,000	
Panoche WD	8,600	
Panoche WD	3,750	
Patterson ID	350	
RD106	228	
San Luis WD	1,500	
San Luis WD	11,400	
San Luis WD	433	
San Luis WD	150	
San Luis WD	223	
San Luis WD	1,814	
San Luis WD	50	
Semitropic		(10,000)
SJREC/SLDMWA	24,869	
TLBWSD	6,000	
TLBWSD	3,000	
Tranquillity ID	1,500	
Transfer/Exchanges Total	88,193	(10,000)

Water Accounting

The intent of this section is to arrange quantified water supplies, uses and losses discussed earlier and arrange it in a water accounting form. These tables are intended to assist when analyzing best management practices, the water savings resulting from an individual practice can be estimated based on the water inventory. The water accounting is broken down into several tables, Surface Water Supply, Ground Water Supply, Water Supplies, Conveyance System Losses, Crop Water Needs, and Overall Water Budget.

Table 24: 2006 Water Supply
(Crop Year)

Month	USBR, Ag AF	State Project AF	Local Water Supply, AF	Upslope Drain Water, AF	Total AF
October 2005	46,417				46,417
November	39,192				39,192
December	50,782				50,782
January 2006	50,413				50,413
February	77,453				77,453
March	44,994				44,994
April	39,592				39,592
May	119,179				119,179
June	207,578				207,578
July	229,809				229,809
August	155,373				155,373
September	62,299				62,299
Total	1,123,081				1,123,081

Table 25: 2006 Groundwater Supply
(Crop Year)

	Pumped by District		Pumped by District Water Users		
Month	Basin 1 AF	Basin 2 AF	Basin 1 AF	Basin 2 AF	Total AF
October 2005			1,064		1,064
November			872		872
December			2,216		2,216
January 2006			1,328		1,328
February			1,228		1,228
March			300		300
April			1,408		1,408
May			568		568
June			3,216		3,216
July			6,112		6,112
August			5,320		5,320
September			2,292		2,292
Total			25,924		25,924

Table 26: 2006 Water Supplies
(Crop Year)

Month	Surface Water AF	Ground Water AF	Effective Precipitation AF	Reclaimed Water AF	Total AF
October 2005	46,417	1,064	0		47,481
November	39,192	872	2,679		40,228
December	50,782	2,216	13,962		62,386
January 2006	50,413	1,328	133,768		185,509
February	77,453	1,228	1,613		80,294
March	44,994	300	39,124		84,418
April	39,592	1,408	7,592		48,592
May	119,179	568	27,395		147,142
June	207,578	3,216	0		210,724
July	229,809	6,112	0		235,921
August	155,373	5,320	0		160,693
September	62,299	2,292	0		64,591
TOTAL	1,123,081	25,924	219,045		1,368,050

Table 27: 2006-Conveyance System Losses
(Crop Year)

Lateral or Res.	Length Miles	Seepage AF	Evaporation AF	Operational Spills AF	Total Losses AF
7-1 Inlet Canal	7.4	0	0	0	0
Regulating Res.		196	31	0	227
TOTAL	7.4	196	31	0	227

Table 28: 2006-Crop Water Needs
(Crop Year)

Crop	Area Acres	Planting Month	Harvest Month	Crop ET AF/Ac	Leaching Requirement AF/Ac	Cultural Practices AF/Ac	Water Needs AF
Alfalfa Hay	13,305	Perennial	------	3.95	0.20	0.00	53,896
Alfalfa Seed	1,887	Perennial	Sep	2.56	0.12	0.00	4,977
Almonds	66,379	Perennial	Aug	4.24	0.29	0.00	317,458
Barley	6,241	Nov	May	0.97	0.01	0.00	4,345
Beans	7,037	May	Sep	1.65	0.09	0.00	11,783
Cantaloupe	15,580	Apr	Oct	0.84	0.02	0.00	10,330
Cotton	130,886	Apr	Oct	2.10	0.02	0.00	249,539
Garlic	10,486	Nov	Aug	1.10	0.06	0.10	12,430
Grapes	13,644	Apr	Sep	1.84	0.11	0.00	23,424
Lettuce-Spring	16,671	Dec	Apr	0.32	0.00	0.09	2,597
Lettuce-Fall	11,221	Sep	Oct	0.12	0.01	0.13	5,004
Onions	18,339	Nov	Aug	2.21	0.17	0.10	63,088
Pistachios	18,647	Perennial	Aug	2.59	0.16	0.00	50,630
Safflower	2,843	Mar	Aug	1.90	0.03	0.00	4,606
Sugar Beets	4,542	Feb	Sep	2.76	0.04	0.00	14,536
Tomatoes, Fresh	5,833	Apr	Jun	1.28	0.04	0.00	6,478
Tomatoes, Process	87,445	Mar	Jun	1.45	0.04	0.14	120,583
Wheat	35,723	Nov	Jun	1.28	0.02	0.00	39,072
Field-Misc.	27,070			2.00	0.06	0.00	76,783
Truck-Misc.	22,799			1.50	0.08	0.00	46,234
Tree & Vines-Misc.	8,534	Perennial	____	2.50	0.14	0.00	30,286
TOTAL	525,112						1,148,081

Table 29: 2006-Overall Water Budget
(Crop Year)

Step 2A-2006 Water Supply		From Table 27		1,368,050	AF
District Beneficial Uses					
2A2e	Environmental Consumptive Use		minus	28	AF
2C3	Ground Water Recharge	(planned)	minus	0	AF
2C4	Water Exchanges or Transfers		plus or minus	78,253	AF
		Water Supply Available for Use		1,446,275	AF
District Non-Beneficial Uses					
2A2a	Conveyance System Seepage*	Table 28	minus	196	AF**
2A2a	Conveyance System/Reservoir Evaporation**	Table 28	minus	8,781	AF***
2A2a	Conveyance System Spills	Table 28	minus	0	AF
2A2d	Consumptive Use by Riparian Vegetation	(estimate)	minus	0	AF
		Available Water Supply		1,437,298	AF
		Quantity of Water Actually Delivered to Customers		1,437,298	AF
2C1	Crop Water Needs	Table 29	minus	1,148,081	AF
2D	On farm Drain/Spill Water Leaving the District	(estimate)	minus	0	AF
2D	Deep Percolation, in excess of Leaching Requirement		EQUALS	289,217	AF

* Wetlands mitigation on lateral 14.
** Mendota Pool inlet canal plus regulating reservoirs on pumped laterals.
*** Canal evaporation and misc. evaporation losses from on-farm surface irrigation systems

Table 30: 2006-Deep Percolation and Conveyance Seepage
(Crop Year)

Deep Percolation (Table 18)	AF	289,217
Conveyance Seepage (Table 28)	AF	196
Total of Deep Percolation plus Conveyance Seepage	AF	289,413
Irrigated acres (Table 29)	Ac	525,112
Irrigated acres over a perched water table, 5 feet or less	Ac	16,351
Irrigated acres over a salt sink, 20 feet or less	Ac	335,953
Portion of Deep Percolation/Conveyance Seepage flowing to a perched water table		3%
Portion of Deep Percolation/Conveyance Seepage flowing to a salt sink		64%
Total flowing to a perched water table or saline sink, AF		185,159

Table 31: Annual Water Quantities Delivered Under Each Right or Contract
(Water Year)

Year	USBR	USBR (CL II)	SWP Contract	Transfers	Totals
1987	1,150,300			6,069	1,156,369
1988	1,215,000			15,959	1,230,959
1989	1,152,118			108,599	1,260,717
1990	694,491			18,502	712,993
1991	404,102			88,447	492,549
1992	488,083			124,143	612,226
1993	788,871			231,441	1,020,312
1994	606,392			146,368	752,760
1995	1,210,061			138,428	1,348,489
1996	1,173,028			264,142	1,437,170
1997	1,182,834			293,914	1,476,748
1998	961,912			179,765	1,141,677
1999	930,680			290,558	1,221,238
2000	831,094			359,129	1,190,223
2001	685,894			232,865	918,759
2002	882,694			158,373	1,041,067
2003	968,668			141,626	1,110,294
2004	918,362			144,939	1,063,301
2005	1,102,479			128,072	1,230,551
2006	1,251,170			84,015	1,335,185
Total	18,598,223			3,155,354	21,753,577
Average	*929,911*			*157,768*	*1,087,679*

Table 32: M&I Water Delivered in Westlands in 2006 [27]

Customer Type	Number of Connections	2006 Use (AF)
Single Family		0
Multi-family		0
Commercial	3	300
Industrial	36	1,021
Institutional	7	297
Landscape Irrigation		0
Wholesale		0
Reclaimed		0
Other, Incidental Ag		0
Unaccounted		0
Total	46	1,618

[27] There are no wastewater collection & treatment systems or recycling of M&I water in the District.

Section 3

Best Management Practices for Agricultural Contractors

Critical Best Management Practices

For the purposes of the USBR CVPIA Criteria, this Plan needs to describe the program that the District determines will best accomplish each Best Management Practice (BMP). The law specifies that the Criteria identify BMPôs including, but not limited to, efficient water management practices being developed according to California State law or reasonable alternatives. For the purposes of these Criteria, a ñBMPò means:

1. An established and generally accepted practice among water districts that result in more efficient use, conservation or management of water;

2. A practice for which sufficient data are available from existing water management projects to indicate that a significant efficiency improvement or management related benefit can be achieved; that the practice is technically and economically reasonable and not socially or environmentally unacceptable; and that the practice is not otherwise unreasonable for most water districts to carry out.

BMPôs are, for all intents and purposes, identically defined as the Efficient Water Management Practices (EWMP) and will generally be acceptable to the Agricultural Water Management Council (Ag Council), for water management plan purposes, established under provisions of the AB 3616 process. While the Ag Councilôs EWMPôs have an economic feasibility component, the classification of practices is similar.

In general, BMPôs under the Criteria have been categorized into two general groups:

1. Critical Best Management Practices
2. Exemptible Best Management Practices

Critical BMPôs are required to be implemented or are already implemented. Exemptible BMPôs shall be implemented, unless the District demonstrates that the practice does not make sense for the District to implement. For appropriate BMPôs, the District will provide a description of the implementation plan and include time schedules, budgets and monitoring plans. If a BMP is to be studied, provide details and schedules of the study. These studies must be expeditious and be completed before the next Plan update. The intent of the exemption process is to demonstrate in a clear and concise manner that a BMP is not cost-effective, not financially feasible, not legal or not environmentally possible for a District to implement. Reclamation will consider exemption requests prepared using the final AB-3616 exemption process.

The following sections will describe current and proposed District programs, which are applicable to each BMP. Please see Appendix F for fore detailed planned budget expenditures.

BMP A1: Measurement

Summary of Actions Year 2006

Total number of customers:	680
Total number of customers with measured deliveries:	680
Number of measurement devices installed this year:	0
Number of measurement devices upgraded:	0

Comments:

All Westlands Water District deliveries are metered and most customers have multiple meters. 584 meters were serviced and 768 were recalibrated with 3,954 hours and 1,737 hours expended respectively.

Revenue increased after improved measurement:	No
Water savings from improved measurement:	No
Estimated acre-feet saved:	0
2006 Expenditures:	$229,000
2006 Staff Hours:	5,700

Anticipated Year 2007 Budget

Number of measurement devices planned to install next year:	0
Number of measurement devices planned to be upgraded next year:	0

Comments:

Westlands Water District will continue to service and calibrate exiting meters at a similar pace in 2007.

2007 Projected Expenditures:	$200,500
2007 Projected Staff Hours:	6,000

BMP A2: Conservation Coordinator

Summary of Actions Year 2006

Name of Coordinator:	Russ Freeman
E-Mail:	rfreeman@westlandswater.org
Title:	Supervisor of Resources
Address:	P.O. Box 6056, Fresno, CA 93703
Phone:	(559) 241-6241
Fax:	(559) 241-6277
Cell Phone:	

2006 Expenditures:	$81,370
2006 Staff Hours:	2,080

Summary of Year 2007 Projected Actions

2007 Projected Expenditures:	$83,000
2007 Projected Staff Hours:	2,080

BMP A3A: Water Management Services: On-Farm Evaluations

Summary of Actions Year 2006

Number of acres surveyed:	4,317

Comments:

The District contracted with the ITRC for mobile lab services on micro irrigation systems installed under the Districtôs Irrigation System Improvement program. Thirty-five systems were evaluated and found to have an average low quarter DU of 87%.

Actual Benefits Year 2006

Identified efficiency losses:	No
Reduced tailwater	No
Other:	

2006 Expenditures:	$400,000
2006 Staff Hours	16

Summary of Year 2007 Projected Actions

Number of acres to be surveyed:	0

Comments:

The District will participate in any available cost share programs offered via the SLDMWA and USBR on mobile lab services.

BMP A3B: Water Management Services: Real-Time ET Information

Actual Benefits Year 2006

Number of customers provided information:	680

Method of data distribution:

Newspaper:	No
Bills:	No
Newsletter:	Yes
Internet:	Yes

Other:

The Irrigation Guide is delivered to all water users on a weekly basis either by fax, email and/or mail. It is available to all via the District website.

2006 Expenditures:	$2,043
2006 Staff Hours:	173

Summary of Year 2007 Projected Actions

List any projected changes:

The publication will continue in the same form as the prior year.

2007 Projected Expenditures:	$2,100
2007 Projected Staff Hours:	180

BMP A3C: Water Management Services: Water Quality Data

Summary of Actions Year 2006

Water quality issue:	No
Ground water analyzed:	Yes
Surface water analyzed:	Yes

Comments:

During the annual groundwater survey in Nov/Dec, all wells, that are running, are measured for EC. Additionally, the District conducts an M&I raw water analysis for M&I customers who operate licensed treatment facilities so that they can comply with DHS reporting. Links to data from DWR continuous monitoring stations along the California Aqueduct are on the District website.

Actual Benefits Year 2006

List any decisions based on analysis of water:	None

2006 Expenditures:	$22,660
2006 Staff Hours:	200

Summary of Year 2007 Projected Actions

List any decisions based on analysis of water:	None

2007 Projected Expenditures:	$24,000
2007 Projected Staff Hours:	200

BMP A3D: Water Management Services: Educational Programs

Summary of Actions Year 2006
List educational programs the district supported or participated in:

The District produces monthly newsletters to water users and landowners that consist of water supply information, legislative updates, District sponsored programs, and community items. The District continuously updates its website with current topical information, resource and educational materials relevant to Westlands.

2006 Expenditures:	$23,000
2006 Staff Hours:	600

Summary of Year 2007 Projected Actions
List educational programs the district plans to support or participate in:

The Districtôs educational programs will be similar to 2006.

2007 Projected Expenditures:	$24,000
2007 Projected Staff Hours:	600

BMP A4: Pricing Structure

Summary of Actions Year 2006
District has taken the following steps this year to prepare for conversion to billing based at least partly by volume:

Westlands operates an average annual allocation below 100% of Contract amount. That incremental amount of water necessary to make a crop must either come from land fallowing at a cost to the water user or supplemental purchases at a cost of more than double the Contract amount.

Comments:
None

2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions
If not already billing in part by volume, enter the year the district plans to convert to billing by volume:

Comments:

None

2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP A5: Policy Evaluation

Summary of Actions Year 2006
List any policy changes or suggestions concerning water conservation/management (internal or external) recommended during the year:

Actual Benefits Year 2006
List any benefits received as a result of policy changes. Quantify the benefits if possible in terms of volume of water saved or affected, or dollars:

2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions
List any policies identified for review:

2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP A6: Contractor Pump Efficiency

Summary of Actions Year 2006
Number of contractor pumps tested for efficiency during the year 2006: 354

Quantify the benefits, if possible, in terms of volume of water saved or affected, or dollars in energy savings:

District pumps range in size from 15 Hp to 700 Hp and are on a triennial testing program. Overhauls are scheduled when pumps test out at less than 60% efficiency threshold.

Comments:

The District overhauled 35 pumps that tested below the 60% efficiency threshold.

2006 Expenditures	$271,162
2006 Staff Hours	4,700

Summary of Year 2007 Projected Actions

Number of pumps expected to be tested (2007):	350

Comments:

2007 Projected Expenditures:	$300,000
2007 Projected Staff Hours:	5,000

BMP B1: Facilitate Alternative Land Use

Summary of Actions Year 2006

The district has land suitable for alternative use.

The district in cooperation with the land owners have converted the following number of acres this year:	0
The district in cooperation with landowners have converted the following total number of acres this year and all past years:	100,000

Comments:

The District has acquired approximately 100,000 Acres. Annually the District spends $2,000,000 to service a $100,000,000 debt issued for the purchase of these lands. One full time staff manages the leasing of these lands for dry faming and grazing. $150,000 for consulting; $300,000 discing.

2006 Expenditures	$81,400
2006 Staff Hours	2,080

Summary of Year 2007 Projected Actions

Areas expected to be converted:	0

Comments:

2007 Projected Expenditures:	$83,000
2007 Projected Staff Hours:	2,080

BMP B2: Use of Recycled Water

Summary of Actions Year 2006

Comments:

District has no recycled water opportunities (no water treatment facilities in surrounding area).

Actual Benefits Year 2006

Quantify the benefits, if possible, in terms of volume of water saved or affected, or dollars:

2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions
Estimated acre-feet of water that may be available for recycling in the future: 0

Comments:

District will investigate recycled water opportunities.

2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B3: Capital Improvements of On-Farm Irrigation

Summary of Actions Year 2006
District distributes information on programs offered by others provide listing:

The District Irrigation System Improvement lease program offers water users an opportunity to lease own equipment such as drip, micro-spray, sprinkler, and aluminum pipe. The goal of the program is to encourage conversion to more efficient means of irrigation.

Comments:

Actual Benefits Year 2006

Estimate the dollar value of on farm improvements facilitated by the district:	$5,200,000
2006 expenditures on facilitation of farm improvements:	$24,200
2006 staff hours on facilitation of farm improvements:	940

Summary of Year 2007 Projected Actions
District is expecting to facilitate a funding program. List program(s) expected to be available:

The Irrigation System Improvement program will continue indefinitely as it is structured as a revolving fund.

2007 Projected Expenditures:	$2,500,000
2007 Projected Staff Hours:	470

BMP B4: Incentive Pricing

Summary of Actions Year 2006
District has an incentive price program: Yes

District is developing an incentive priced program:	No
Water savings from incentive priced program:	No

Comments:

Actual Benefits Year 2006

Describe the objectives/benefits of the incentive pricing program.

Quantify where possible the effect of the incentive pricing program in terms of water dollars:

The District allows all water users to transfer water to others in the District and/or to transfer water from other water districts into the District. Additionally, the District sponsors a supplemental purchase program. The costs of most transfers are driven by market forces and thus often results in costs exceeding $120 per acre foot.

2006 Expenditures	$27,400
2006 Staff Hours	700

Summary of Year 2007 Projected Actions

List any changes expected in the incentive pricing program:

The District projects that water users who subscribe to the Supplemental Purchase Program will be subjected to prices more than twice the Cost of the Service rate.

If the district has no program, the district will have an incentive pricing program in:	Unknown
2007 Projected Expenditures:	$29,000
2007 Projected Staff Hours:	700

BMP B5A: Line or Pipe Ditches and Canals

Summary of Actions Year 2006

District has all ditches lined or piped:	No
District is investigating lining or piping canals:	No
Miles of pipeline installed this year:	0
Miles of canal lined this year:	0

Comments:

Calculated Actual Benefits Year 2006

Acre-feet, estimated water saved from lining or piping canal:	0
2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

Proposed miles of canal to be piped or lined:	0

Comments:

Anticipated Year 2007 Benefits

Acre-feet of water savings from proposed projects:	0
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B5B: Regulatory Reservoirs

Summary of Actions Year 2006

District has regulatory reservoirs:	Yes
District is investigating regulatory reservoirs:	No
District plans to add regulatory reservoirs:	No
District regulatory reservoirs constructed:	No

Comments:

The Districts right bank laterals have terminal (regulatory) reservoirs or tanks which improves distribution system delivery flexibility.

Calculated Actual Benefits Year 2006

Current total capacity of regulatory reservoirs (acre-feet):	0
Estimated water savings from spills or operational improvements related to regulatory reservoirs (acre-feet):	0
Improved water management with regulatory reservoirs:	No

Comments:

2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

District will install or investigate development of regulatory reservoirs:	No

Comments:

Anticipated Year 2007 Benefits

Estimate additional capacity to be added in 2007 (acre-feet):	0
Estimate additional capacity needed for optimum operation (acre-feet):	0
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B6: Flexible Water Ordering

Summary of Actions Year 2006

District has an on-demand delivery system:	Yes
District has reached the maximum flexibility currently feasible without major physical improvements to the delivery system:	Yes
District is investigating improving delivery flexibility:	No

Describe any improvements in delivery flexibility completed or under investigation:

Actual Benefits Year 2006

Estimate the number of acres benefited by increased flexibility (acres):	0
2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

Comments:

No action taken at this time.

Anticipated Year 2007 Benefits

Improved service to customers:	No
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B7: Spill and Tailwater Recovery

Summary of Actions Year 2006

District has spills or tailwater leaving the district:	No
District is investigating development of a spill/tailwater recovery system:	No
District implemented a spill/tailwater recovery program:	No

Comments:

District prohibits spilling of tailwater, per District regulations. Water users in violation may have service terminated.

Calculated Actual Benefits Year 2006

Acre-feet, estimated water conserved by implementing a spill/tailwater recovery program:	0
2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

District will investigate implementation of a spill/tailwater recovery program:	No

District will implement or continue a spill/tailwater recovery system:	No

Comments:

District prohibits spilling of tailwater, per District regulations. Water users in violation may have service terminated.

Anticipated Year 2007 Benefits

Acre-feet, estimated water conserved from the proposed or continued project:	0
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B8: Conjunctive Use

Summary of Actions Year 2006

District has conjunctive use options:	No
District is investigating a conjunctive use program:	No
District implemented a conjunctive use program:	Yes

Comments:

Deep groundwater wells are monitored each December and a report of groundwater conditions is prepared. Water users may utilize the piped distribution system for transport of groundwater and to offset the use of surface water. Groundwater integration is subject to drinking water standards.

Calculated Actual Benefits Year 2006

Acre-feet, water charged to ground water or otherwise stored:	0
Acre-feet of water pumped from wells or otherwise retrieved:	15,000
2006 Expenditures	$9,700
2006 Staff Hours	300

Summary of Year 2007 Projected Actions

District will investigate a conjunctive use program:	No
District will implement a conjunctive use program:	No

Comments:

Anticipated Year 2007 Benefits

Acre-feet, water expected to be charged to ground water or otherwise stored:	0
Acre-feet of water expected to be pumped from wells or otherwise retrieved:	100,000
2007 Projected Expenditures:	$10,000
2007 Projected Staff Hours:	300

BMP B9: Automate Canal Structures

Summary of Actions Year 2006

Districtôs distribution system is completely automated:	No
District is investigating system automation:	No
District implemented an automation project:	No

Comments:

The Coalinga Canal structures are completely automated which gives the District control over its water supplies.

Implementation of project reduced spills or increased flexibility:	No
Acre-feet, estimated amount of water that would have spilled without the project:	0

Calculated Actual Benefits Year 2006

Implementation of project improved service to customers:	No
Acres, estimated acres provided with improved service:	0
2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

District will investigate automation for distribution system:	No
District will implement an automation project:	No

Comments:

Anticipated Year 2007 Benefits

Acre-feet, estimate of water spill which could be eliminated by proposed automation project:	0
Acres, estimate of acres provided with improved service by proposed automation project:	0
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

BMP B10: Water Use Pumping

Summary of Actions Year 2006

District promotes a local utility companies pump testing program:	No
District promotes its own pump testing program for its customers:	Yes

List method(s) of promotion:

Water users who are enrolled in the Districts Groundwater Management Program are required to maintain an efficiency of 60% or greater. Tests are required on a triennial basis. The cost is borne by the water although they may participate in 50% cost share with the San Luis Delta Mendota Water Authority via District.

Number of customer pumps tested:	80
2006 Expenditures	$0
2006 Staff Hours	0

Summary of Year 2007 Projected Actions

District will promote pump testing program:	Yes
Estimated number of customer pumps to be tested:	80
2007 Projected Expenditures:	$0
2007 Projected Staff Hours:	0

Section 4

Best Management Practices for Urban

Background

The mission of Westlands Water District (District) is to provide a timely, reliable and affordable water supply to its landowners and water users, and to provide drainage service to those lands where it is necessary. The Districtôs farmers are very efficient in the management and utilization of available water supplies as identified in the Districtôs Agricultural Water Management Plan submitted to the United States Bureau of Reclamation (USBR) in September 1999.

The District does not have a USBR Municipal and Industrial (M&I) water supply contract, but does exercise provisions in its Agricultural Water Service Contract for use of water for ñincidental agricultural purposesò. These purposes include M&I activities incidental to agricultural operations including but not limited to single-family dwellings, farm housing, commercial operations, and industrial operations.

This Urban Water Management Plan (Plan) is supplemental to the aforementioned Agricultural Water Management Plan and included in this Plan are appropriate sections from the agricultural plan. This Plan is submitted in accordance with CVPIA and the 1999 plan criteria developed by the USBR.

The water delivered for M&I purposes under this Plan is not treated, is not in a potable state, and the District does not warrant the quality of the water. A portion of the M&I supply is delivered to Public Water Systems within the District that are regulated by the State and County Department of Health Services. However, none of these suppliers is a retail supplier

The water conveyed to the Lemoore Naval Air Station (LNAS) is not subject to the provisions of this Plan since LNAS is under Department of Defense water conservation regulations. M&I water is delivered through the Districtôs distribution system to the cities of Huron, Avenal and Coalinga, however, they are responsible to develop their own individual urban water management plans, and as such, they are not considered under this Plan.

This Plan identifies all other water uses delivered into the District that are non-agricultural. Historically the USBR and the District have categorized these uses as M&I for administrative purposes, however, this Plan provides a further categorization of ñtrueò M&I uses and ñincidental agriculturalò uses under the provisions of the Districtôs contract.

This Plan will present the required water resources information and a plan for implementing the appropriate Best Management Practices (BMPôs).

BMP 01: Water Survey Programs for Single-Family and Multi-Family Residential Customers

A. Implementation

1. Based on your signed MOU date, 01/01/1999, your Agency STRATEGY DUE DATE is:	12/31/2000
2. Has your agency developed and implemented a targeting/ marketing strategy for SINGLE-FAMILY residential water use surveys?	No
a. If YES, when was it implemented?	
3. Has your agency developed and implemented a targeting/ marketing strategy for MULTI-FAMILY residential water use surveys?	No
a. If YES, when was it implemented?	

B. Water Survey Data

Survey Counts:	Single Family Accounts	Multi-Family Units
1. Number of surveys offered:	0	0
2. Number of surveys completed:	0	0
Indoor Survey:		
3. Check for leaks, including toilets, faucets and meter checks	No	No
4. Check showerhead flow rates, aerator flow rates, and offer to replace or recommend replacement, if necessary	No	No
5. Check toilet flow rates and offer to install or recommend installation of displacement device or direct customer to ULFT replacement program, as necessary; replace leaking toilet flapper, as necessary	No	No
Outdoor Survey:		
6. Check irrigation system and timers	No	No
7. Review or develop customer irrigation schedule	No	No
8. Measure landscaped area (Recommended but not required for surveys)	No	No
9. Measure total irrigable area (Recommended but not required for surveys)	No	No
10. Which measurement method is typically used (Recommended but not required for surveys)		None
11. Were customers provided with information packets that included evaluation results and water savings recommendations?	No	No
12. Have the number of surveys offered and completed, survey results, and survey costs been tracked?	No	No
a. If yes, in what form are surveys tracked?		None

b. Describe how your agency tracks this information.

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

Westlands does not provide potable water service to single family and multi family residential customers. Their uses, if any, are incidental to agricultural operations at the locations.

BMP 02: Residential Plumbing Retrofit

A. Implementation

1. Is there an enforceable ordinance in effect in your service area requiring replacement of high-flow showerheads and other water use fixtures with their low-flow counterparts? No
    a. If YES, list local jurisdictions in your service area and code or ordinance in each:
2. Has your agency satisfied the 75% saturation requirement for single-family housing units? No
3. Estimated percent of single-family households with low-flow showerheads: %
4. Has your agency satisfied the 75% saturation requirement for multi-family housing units? No
5. Estimated percent of multi-family households with low-flow showerheads: %
6. If YES to 2 or 4 above, please describe how saturation was determined, including the dates and results of any survey research.

B. Low-Flow Device Distribution Information

1. Has your agency developed a targeting/ marketing strategy for distributing low-flow devices? No
    a. If YES, when did your agency begin implementing this strategy?
    b. Describe your targeting/ marketing strategy.

Low-Flow Devices Distributed/ Installed	**SF Accounts**	**MF Units**
2. Number of low-flow showerheads distributed:	0	0

3. Number of toilet-displacement devices distributed:	0	0
4. Number of toilet flappers distributed:	0	0
5. Number of faucet aerators distributed:	0	0
6. Does your agency track the distribution and cost of low-flow devices?		No
a. If YES, in what format are low-flow devices tracked?		
b. If yes, describe your tracking and distribution system:		

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP?	No
a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be "at least as effective as."	

D. Comments

BMP 03: System Water Audits, Leak Detection and Repair

A. Implementation

1. Does your agency own or operate a water distribution system?	Yes
2. Has your agency completed a pre-screening system audit for this reporting year?	Yes
3. If YES, enter the values (AF/Year) used to calculate verifiable use as a percent of total production:	
a. Determine metered sales (AF)	1,133,832
b. Determine other system verifiable uses (AF)	0
c. Determine total supply into the system (AF)	1,127,332
d. Using the numbers above, if (Metered Sales + Other Verifiable Uses) / Total Supply is < 0.9 then a full-scale system audit is required.	1.01
4. Does your agency keep necessary data on file to verify the values entered in question 3?	Yes
5. Did your agency complete a full-scale audit during this report year?	No
6. Does your agency maintain in-house records of audit results or completed AWWA M36 audit worksheets for the completed audit which could be forwarded to CUWCC?	Yes
7. Does your agency operate a system leak detection program?	Yes
a. If yes, describe the leak detection program:	

Water is metered at the head of each lateral and at the delivery outlet meter. Monthly a prescreening audit is performed to compare total deliveries to a lateral to total deliveries from a lateral. Meter calibration averages +/- 2% for the District.

B. Survey Data

1. Total number of miles of distribution system line. 1,034
2. Number of miles of distribution system line surveyed. 1,034

C. "At Least As Effective As"

1. Is your agency implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

Voluntary Questions (Not used to calculate compliance)

E. Volumes

	Estimated	Verified
1. Volume of raw water supplied to the system:		
2. Volume treated water supplied into the system:		
3. Volume of water exported from the system:		
4. Volume of billed authorized metered consumption:		
5. Volume of billed authorized un-metered consumption:		
6. Volume of unbilled authorized metered consumption:		
7. Volume of unbilled authorized un-metered consumption:		

F. Infrastructure and Hydraulics

1. System input (source or master meter) volumes metered at the entry to the:
2. How frequently are they tested and calibrated?
3. Length of mains:
4. What % of distribution mains are rigid pipes (metal, ac, concrete)?
5. Number of service connections:
6. What % of service connections are rigid pipes (metal)?
7. Are residential properties fully metered?
8. Are non-residential properties fully metered?
9. Provide an estimate of customer meter under-registration:

10. Average length of customer service line from the main to the point of the meter:
11. Average system pressure:
12. Range of system pressures: From to
13. What percentage of the system is fed from gravity feed?
14. What percentage of the system is fed by pumping and re-pumping?

G. Maintenance Questions

1. Who is responsible for providing, testing, repairing and replacing customer meters?
2. Does your agency test, repair and replace your meters on a regular timed schedule?
    a. If yes, does your agency test by meter size or customer category?:
    b. If yes to meter size, please provide the frequency of testing by meter size:
        Less than or equal to 1"
        1.5" to 2"
        3" and Larger
    c. If yes to customer category, provide the frequency of testing by customer category:
        SF residential
        MF residential
        Commercial
        Industrial & Institutional
3. Who is responsible for repairs to the customer lateral or customer service line?
4. Who is responsible for service line repairs downstream of the customer meter?
5. Does your agency proactively search for leaks using leak survey techniques or does your utility reactively repair leaks which are called in, or both?
6. What is the utility budget breakdown for:

Leak Detection	$
Leak Repair	$
Auditing and Water Loss Evaluation	$
Meter Testing	$

H. Comments

BMP 04: Metering with Commodity Rates for all New Connections and Retrofit of Existing

A. Implementation

1. Please fill out the following matrix:

Types of Billed Accounts	% Accounts Metered	% Accounts Measured (Not Metered)	% Accounts Volumetric Billing
Treated Water SF Residential Accounts	0		0
Treated Water MF Residential Accounts	0		0
Treated Water Commercial Accounts	100		100
Treated Water Industrial Accounts	100		100
Treated Water Institutional Accounts	100		100
Raw Water Residential Deliveries	0	0	0
Raw Water Non-Residential Deliveries	0	0	0

2. If your agency does not meter 100% of all treated water accounts:
    a. Does your agency have a plan or program for retrofitting existing un-metered treated water connections? No
    b. By what date would 100% of all treated water accounts be metered?
    c. Number of previously un-metered accounts fitted with meters during report year:
    3. If your agency does bill 100% of all treated water accounts by volume of use:
    a. By what date (Year must be four digit mm/dd/yyyy) will all customers with meters be billed by volume of use?
4. If your agency does not meter or measure 100% of all raw water delivery fields (as listed in question 1f & 1g), does your agency intend to develop a program for measuring all raw water deliveries? Yes
5. If your agency does not volumetrically bill 100% of all raw water delivery, does your agency intend to develop a program for billing all raw water deliveries by volume of use? Yes

6. Does your agency meter by volume of use all municipal or governmental accounts?: Yes
    a. If no, which types of accounts are not included:
7. Does your agency bill by volume of use all municipal or governmental accounts? Yes
    a. If no, which types of accounts are not included:

B. Feasibility Study

1. Has your agency conducted a feasibility study to assess the merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters? No
    a. If YES, when was the feasibility study conducted? (mm/dd/yy)
    b. Describe the feasibility study:
2. Number of CII accounts with mixed-use meters: 0
3. Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period 0

D. "At Least As Effective As"

1. Is your agency implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

E. Comments

BMP 05: Large Landscape Conservation Programs and Incentives

A. Water Use Budgets

1. Number of Dedicated Irrigation Meter Accounts: 0
2. Number of Dedicated Irrigation Meter Accounts with Water Budgets: 0
3. Budgeted Use for Irrigation Meter Accounts with Water Budgets (AF) during reporting year: 0
4. Actual Use for Irrigation Meter Accounts with Water Budgets (AF) during reporting year: 0
5. Does your agency provide water use notices to accounts with budgets each billing cycle? Yes

B. Landscape Surveys

1. Has your agency developed a marketing / targeting strategy for landscape surveys? No

a. If YES, when did your agency begin implementing this strategy?
b. Description of marketing / targeting strategy:

2. Number of Surveys Offered during reporting year. 0
3. Number of Surveys Completed during reporting year. 0
4. Indicate which of the following Landscape Elements are part of your survey:
   a. Irrigation System Check No
   b. Distribution Uniformity Analysis No
   c. Review / Develop Irrigation Schedules No
   d. Measure Landscape Area No
   e. Measure Total Irrigable Area No
   f. Provide Customer Report / Information No
5. Do you track survey offers and results? No
6. Does your agency provide follow-up surveys for previously completed surveys? No
   a. If YES, describe below:

C. Other BMP 5 Actions

1. An agency can provide mixed-use accounts with ETo-based landscape budgets in lieu of a large landscape survey program. Does your agency provide mixed-use accounts with landscape budgets? No
2. Number of CII mixed-use accounts with landscape budgets. 0
   Number of CII accounts with mixed-use meters retrofitted with dedicated irrigation meters during reporting period. (From BMP 4 report) 0
   Total number of change-outs from mixed-use to dedicated irrigation meters since Base Year.
3. Do you offer landscape irrigation training? No
4. Does your agency offer financial incentives to improve landscape water use efficiency? No

Type of Financial Incentive:	Budget (Dollars/ Year)	Number Awarded to Customers	Total Amount Awarded
a. Rebates	0	0	0
b. Loans	0	0	0
c. Grants	0	0	0

5. Do you provide landscape water use efficiency information to new customers and customers changing services? No
   a. If YES, describe below:

6. Do you have irrigated landscaping at your facilities? No
   a. If yes, is it water-efficient?

b. If yes, does it have dedicated irrigation metering?

7. Do you provide customer notices at the start of the irrigation season? No
8. Do you provide customer notices at the end of the irrigation season? No

D. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

E. Comments

BMP 06: High-Efficiency Washing Machine Rebate Programs

A. Coverage Goal

	Single Family	Multi-Family
1. Number of residential dwelling units in the agency service area.	0	0
2. Coverage Goal = Total Dwelling Units x 0.048	= 0 Points	

B. Implementation

1. Does your agency offer rebates for residential high-efficiency washers? No

HEW Water Factor	Number of Financial Incentives	Total Value of Financial Incentives: Water Agency	Wholesaler/ Grants (if Applicable	Energy Utility (if Applicable	TOTAL	POINTS AWARDED
2. **Greater than 8.5 but not exceeding 9.5** (1 point)		$ 0	$ 0	$ 0	$ 0	
3. **Greater than 6.0 but not exceeding 8.5** (2 points)		$ 0	$ 0	$ 0	$ 0	
4. **Less than or equal to 6.0** (3 points)		$ 0	$ 0	$ 0	$ 0	
TOTALS:		$ 0	$ 0	$ 0	$ 0	0

C. Past Credit Points

For HEW incentives issued before July 1, 2004, select ONE of the following TWO options:

Â Method One: Points based on HEW Water Factor

Å Method Two: Agency earns 1 point for each HEW.

NOTE: Agency shall not receive credit for any HEW incentives where the agency did not provide a financial incentive of $25 or more.

Method One: Points based on HEW Water Factor

HEW Water Factor	Number of Financial Incentives	Total Value of Water Agency Financial Incentives	POINTS AWARDED
1. Greater than 8.5 but not exceeding 9.5 (1 point each)	0	$ 0	0
2. Greater than 6.0 but not exceeding 8.5 (2 points each)	0	$ 0	0
3. Less than or equal to 6.0 (3 points each)	0	$ 0	0

Method Two: Agency earns 1 point for each HEW

	Number of Financial Incentives	Total Value of Water Agency Financial Incentives	POINTS AWARDED
4. Total HEWs installed			
PAST CREDIT TOTALS:	0	$ 0	0

D. Rebate Program Expenditures

1. Average or Estimated Administration and Overhead $ 0
2. Is the financial incentive offered per HEW at least equal to the marginal benefits of the water savings per HEW?

E. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

F. Comments

BMP 07: Public Information Programs

A. Implementation

1. How is your public information program implemented?
   Retailer runs program without wholesaler sponsorship

2. Describe the program and how itôs organized:

   Westlands Water District continues to produce and distribute ñThe Irrigator,ò quarterly newsletter that includes water user information, legislative updates and community items. The District continuously updates its website (http://www.westlandswater.org) with the current topical information, resource material and educational materials relevant to Westlands.

3. Indicate which and how many of the following activities are included in your public information program:

Public Information Program Activity in Retail Service Area	Yes/No	Number of Events
a. Paid Advertising	No	0
b. Public Service Announcement	No	0
c. Bill Inserts / Newsletters / Brochures	Yes	20
d. Bill showing water usage in comparison to previous yearôs usage	No	
e. Demonstration Gardens	No	0
f. Special Events, Media Events	No	0
g. Speakerôs Bureau	No	0
h. Program to coordinate with other government agencies, industry and public interest groups and media	Yes	

B. Conservation Information Program Expenditures

1. Annual Expenditures (Excluding Staffing) 27,000

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

BMP 08: School Education Programs

A. Implementation

1. How is your public information program implemented?
   Retailer runs program without wholesaler sponsorship

2. Please provide information on your region-wide school programs (by grade level):

Grade	Are grade-appropriate materials distributed?	No. of class presentations	No. of students reached	No. of teachers' workshops
Grades K-3rd	yes	0	0	0
Grades 4th-6th	yes	0	0	0
Grades 7th-8th	yes	0	0	0
High School	yes	0	0	0

4. Did your Agencyôs materials meet state education framework requirements? No
5. When did your Agency begin implementing this program? 3/1/1990

B. School Education Program Expenditures

1. Annual Expenditures (Excluding Staffing)

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

Each year the District awards Scholarships to a senior from each of six different Westside High Schools. The Scholarship winners are chosen by a committee of District employees through an Application process (which includes an essay) and each winner gets $1,000 paid in their names to the college of their choice.

BMP 09: Conservation Programs for CII Accounts

A. Implementation

1. Has your agency identified and ranked COMMERCIAL customers according to use? yes
2. Has your agency identified and ranked INDUSTRIAL customers according to use? yes
3. Has your agency identified and ranked INSTITUTIONAL customers according to use? yes

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Option A: CII Water Use Survey and Customer Incentives Program

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4. Is your agency operating a CII water use survey and customer incentives program for the purpose of complying with BMP 9 under this option? If so, please describe activity during reporting period: no

CII Surveys	Commercial Accounts	Industrial Accounts	Institutional Accounts
a. Number of New Surveys Offered			
b. Number of New Surveys Completed			
c. Number of Site Follow-ups of Previous Surveys (within 1 yr)			
d. Number of Phone Follow-ups of Previous Surveys (within 1 yr)			

CII Surveys Components	Commercial Accounts	Industrial Accounts	Institutional Accounts
e. Site Visit			
f. Evaluation of all water-using apparatus and processes			
g. Customer report identifying recommended efficiency measures, paybacks and agency incentives			

Agency CII Customer Incentives	Budget ($/Year)	# Awarded to Customers	Total $ Amount Awarded
h. Rebates			
i. Loans			
j. Grants			
k. Others			

Option B: CII Conservation Program Targets

---

5. Does your agency track CII program interventions and water savings for the purpose of complying with BMP 9 under this option? no
6. Does your agency document and maintain records on how savings were realized and the method of calculation for estimated savings? no
7. System Calculated annual savings (AF/yr):

CII Programs	# Device Installations
a. Ultra Low Flush Toilets	
b. Dual Flush Toilets	
c. High Efficiency Toilets	
d. High Efficiency Urinals	
e. Non-Water Urinals	
f. Commercial Clothes Washers (coin-op only; not industrial)	
g. Cooling Tower Controllers	
h. Food Steamers	
i. Ice Machines	
j. Pre-Rinse Spray Valves	
k. Steam Sterilizer Retrofits	
l. X-ray Film Processors	

8. Estimated annual savings (AF/yr) from agency programs not including the devices listed in Option B. 7., above:

CII Programs	Annual Savings (AF/yr)
a. Site-verified actions taken by agency:	
b. Non-site-verified actions taken by agency:	

B. Conservation Program Expenditures for CII Accounts

	This Year	Next Year
1. Budgeted Expenditures	0	0
2. Actual Expenditures	0	

C. "At Least As Effective As"

1. Is your agency implementing an ñat least as effective asò variant of this BMP? yes
   a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

   Westlands Water District has implemented a cap on water use based on historical use.

D. Comments

BMP 11: Conservation Pricing

A. Implementation

Water Service Rate Structure Data by Customer Class

	Number of schedules: For the following accounts, how many rate schedules does agency offer/use?	**Use of classification:** This agency:
1.	**Single-family residential** 0	Does not offer this type of water
2.	**Multi-family residential** 0	Does not offer this type of water
3.	**Commercial** 1	Uses classification in its billing system
4.	**Industrial** 1	Uses classification in its billing system
5.	**Institutional/ government** 1	Uses classification in its billing system
6.	**Dedicated irrigation** (potable water) 0	Does not offer this type of water
7.	**Other** 0	Does not offer this type of water
8.	**Recycled-reclaimed water** 0	Does not offer this type of water
9.	**Raw water** (urban use) 0	Does not offer this type of water
10.	**Wholesale** (urban use) 0	Does not offer this type of water

Sewer Service

11.	Does your agency provide sewer service to your water customers?	No
12.	If yes, does sewer service use conservation rate structures?	No
13.	Has your agency made the required efforts (as prescribed in BMP 11) to have sewer services billed on conservation rates?	No
14.	What water agency activities have been undertaken during the reporting period to achieve waste water agency volumetric billing in your water agency service area?	Other

B. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

C. Comments

3.A. Commercial Rate Schedule A

a.	Water Rate Structure	Uniform
b.	Sewer Rate Structure	Service Not Provided
c.	Total Revenue from only Volumetric Charges	88,480
d.	Total Revenue from Non-Volumetric Charges (Includes fixed fees, surcharges, minimum usage charges, monthly service charges, meter charges etc.)	0
e.	Total Revenue from this category	88,480

3.A. Rate Schedule - Volumetric
Title: M&I

f.	Billing Cycles/year	12
g.	Service Charges/Cycle	0
h.	Gallons/Bill Unit	325,849
i.	Minimum Use/Cycle	0
j.	Non-billed Units (included in monthly service charge)	0

		$/Bill Unit	**Starting At (unit qty.)**
k.	Tier 1	295.28	1
l.	Tier 2		
m.	Tier 3		
n.	Tier 4		
o.	Tier 5		
p.	Tier 6		

q.	Approximate quantity of meters/accounts on this rate schedule	3
r.	Are elevation charges included?	No
s.	Approximate total annual water usage (AF) from customers on this rate schedule	299.66

4.A. Industrial Rate Schedule A

a.	Water Rate Structure	Uniform
b.	Sewer Rate Structure	Service Not Provided
c.	Total Revenue from only Volumetric Charges	301,410
d.	Total Revenue from Non-Volumetric Charges (Includes fixed fees, surcharges, minimum usage charges, monthly service charges, meter charges etc.)	0
e.	Total Revenue from this category	301,410

4.A. Rate Schedule - Volumetric
Title: M&I

f.	Billing Cycles/year	12
g.	Service Charges/Cycle	0
h.	Gallons/Bill Unit	325,851

i. Minimum Use/Cycle 0
j. Non-billed Units (included in monthly service charge) 0

	$/Bill Unit	Starting At (unit qty.)
k. Tier 1	295.28	1
l. Tier 2		
m. Tier 3		
n. Tier 4		
o. Tier 5		
p. Tier 6		

q. Approximate quantity of meters/accounts on this rate schedule 36
r. Are elevation charges included? No
s. Approximate total annual water usage (AF) from customers on this rate schedule 1,020.76

5.A. Institutional Rate Schedule A

a. Water Rate Structure Uniform
b. Sewer Rate Structure Service Not Provided
c. Total Revenue from only Volumetric Charges 87,820
d. Total Revenue from Non-Volumetric Charges (Includes fixed fees, surcharges, minimum usage charges, monthly service charges, meter charges etc.) 0
e. Total Revenue from this category 87,820

5.A. Rate Schedule - Volumetric
Title: M&I

f. Billing Cycles/year 12
g. Service Charges/Cycle 0
h. Gallons/Bill Unit 325,851
i. Minimum Use/Cycle 0
j. Non-billed Units (included in monthly service charge) 0

	$/Bill Unit	Starting At (unit qty.)
k. Tier 1	295.28	1
l. Tier 2		
m. Tier 3		
n. Tier 4		
o. Tier 5		
p. Tier 6		

q. Approximate quantity of meters/accounts on this rate schedule 7

r. Are elevation charges included? No
s. Approximate total annual water usage (AF) from customers on this rate schedule 297.4

BMP 12: Conservation Coordinator

A. Implementation

1. Does your Agency have a conservation coordinator? yes
2. Is a coordinator position supplied by another agency with which you cooperate in a regional conservation program? no
    a. Partner agencyôs name:
3. If your agency supplies the conservation coordinator:
    a. What percent is this conservation coordinatorôs position? 10%
    b. Coordinatorôs Name Russ Freeman
    c. Coordinatorôs Title Supervisor of Resources
    d. Coordinatorôs Experience in Number of Years 12 years, Civil Engineering
    e. Date Coordinator's position was created (mm/dd/yyyy) 3/1/2002
4. Number of conservation staff (FTEs), including Conservation Coordinator. 1

B. Conservation Staff Program Expenditures

1. Staffing Expenditures (In-house Only) 81,370
2. BMP Program Implementation Expenditures 0

C. "At Least As Effective As"

1. Is your agency implementing an ñat least as effective asò variant of this BMP? no
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

BMP 13: Water Waste Prohibition

A. Requirements for Documenting BMP Implementation

1. Is a water waste prohibition ordinance in effect in your service area? Yes
    a. If YES, describe the ordinance:

    All waste is prohibited by District regulation, Article 2, Section 2.6, paragraph I.

2. Is a copy of the most current ordinance(s) on file with CUWCC? No
    a. List local jurisdictions in your service area in the first text box and water waste ordinance citations in each jurisdiction in the second text box:

Westlands Water District	District Regulations, Article 2, Section 2.6, paragraph I.

B. Implementation

1. Indicate which of the water uses listed below are prohibited by your agency or service area.
    a. Gutter flooding Yes
    b. Single-pass cooling systems for new connections Yes
    c. Non-recirculating systems in all new conveyor or car wash systems Yes
    d. Non-recirculating systems in all new commercial laundry systems Yes
    e. Non-recirculating systems in all new decorative fountains Yes
    f. Other, please name No
2. Describe measures that prohibit water uses listed above:

    Any identified waste punishable by termination of water service.

Water Softeners:

3. Indicate which of the following measures your agency has supported in developing state law:
    a. Allow the sale of more efficient, demand-initiated regenerating DIR models. No
    b. Develop minimum appliance efficiency standards that:
        i.) Increase the regeneration efficiency standard to at least 3,350 grains of hardness removed per pound of common salt used. No
        ii.) Implement an identified maximum number of gallons discharged per gallon of soft water produced. No
    c. Allow local agencies, including municipalities and special districts, to set more stringent standards and/or to ban on-site regeneration of water softeners if it is demonstrated and found by the agency governing board that there is an adverse effect on the reclaimed water or groundwater supply. No
4. Does your agency include water softener checks in home water audit programs? No
5. Does your agency include information about DIR and

exchange-type water softeners in educational efforts to encourage replacement of less efficient timer models? No

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

BMP 14: Residential ULFT Replacement Programs

A. Implementation

Number of Non-Efficient Toilets Replaced With 1.6 gpf Toilets During Report Year

	Single-Family Accounts	Multi-Family Units
1. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	No	No

Replacement Method	SF Accounts	MF Units
2. Rebate	0	0
3. Direct Install	0	0
4. CBO Distribution	0	0
5. Other	0	0
Total	0	0

Number of Non-Efficient Toilets Replaced With 1.28 gpf High-Efficiency Toilets (HETs) During Report Year

	Single-Family Accounts	Multi-Family Units
6. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	No	No

Replacement Method	SF Accounts	MF Units
7. Rebate	0	0
8. Direct Install	0	0
9. CBO Distribution	0	0

10. Other		0	0
	Total	0	0

Number of Non-Efficient Toilets Replaced With 1.2 gpf HETs (Dual-Flush) During Report Year

	Single-Family Accounts	Multi-Family Units
11. Does your Agency have program(s) for replacing high-water-using toilets with ultra-low flush toilets?	No	No

Replacement Method	SF Accounts	MF Units
12. Rebate	0	0
13. Direct Install	0	0
14. CBO Distribution	0	0
15. Other	0	0
Total	0	0

16. Describe your agency's ULFT, HET, and/or Dual-Flush Toilet programs for single-family residences.

    The District does not serve single-family residences.

17. Describe your agencyôs ULFT, HET, and/or Dual-Flush Toilet programs for multi-family residences.

    The District does not serve multi-family residences.

18. Is a toilet retrofit on resale ordinance in effect for your service area? No
19. List local jurisdictions in your service area in the left box and ordinance citations in each jurisdiction in the right box:

B. Residential ULFT Program Expenditures

1. Estimated cost per replacement: $0

C. "At Least As Effective As"

1. Is your AGENCY implementing an ñat least as effective asò variant of this BMP? No
    a. If YES, please explain in detail how your implementation of this BMP differs from Exhibit 1 and why you consider it to be ñat least as effective as.ò

D. Comments

Section 5

Plan Implementation

Plan Implementation

1. **Public Information**

The District will continue provide its customers with information related to efficient water management. Water Talk is the District newsletter devoted to non-agricultural water efficiency topics. This semi-annual publication has been published since 1979 and is distributed to all non-agricultural water users. The District water conservation web site will be expanded to include pages concerning non-agricultural water management and conservation. The current real-time agricultural crop water ET information is currently delivered via, the Irrigation Guide is mailed weekly, faxed weekly to all water users who have FAX machines available, and on the web site updated daily, will be expanded to include non-agricultural vegetation water use and irrigation. This web site will also be a portal to other non-agricultural water use resources on the World Wide Web. The following information will also be provided:

- Costs and potential water savings of water management measures.
- Climate-appropriate landscaped designs and plants.
- Efficient landscape irrigation equipment.
- How to determine landscape irrigation timing and quantity based on real-time ET data.
- Efficient plumbing fixtures and cost-sharing programs.
- Commercial, industrial and institutional efficiency programs.

2. **School Education Program**

The District currently has a school outreach program to schools within the service area to provide educational materials and assistance to teachers on subjects related to efficient water management. The District web site will be expanded to include educational and resource materials that will support education and awareness of water conservation concerns. These efforts will continue on an ongoing basis.

Each year the District awards Scholarships to a senior from each of six different Westside High Schools. A committee of District employees through an Application process (which includes an essay) chooses the Scholarship winners and each winner gets $1,000 paid in their names to the college of their choice.

3. **CII Conservation Programs**

The District will provide informational materials that will facilitate audits for all CII water users. The District will seek assistance and work with Reclamation to determine the appropriate conservation measures, surveys and audits for the various types of CII water users in the District. Types of CII water users vary greatly, but are mostly associated with the agricultural nature of the District, crop processing, airstrip operations, roadside businesses, and schools. This variety combined with the small numbers implies that expertise required and assistance provided will be specific to the situation. Informational material and grants from Reclamation for assistance will be important components necessary to achieve results, if improvements are necessary.

Section 6

Regional Criteria

Agricultural Regional Criteria

INFORMATION REQUIRED OF DISTRICTS LOCATED IN THE DRAINAGE PROBLEM AREA

The District is in the Westlands Sub-Area, as identified in A Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley (September 1990). This section presents recommendations from the report that has been incorporated into our water conservation program to improve conditions in the drainage problem areas. The recommendations for 2040 in the Westlands Sub-Area include:

1. Source Control
2. Reusing drainage water
3. Evaporation ponds
4. Pumping the semi-confined aquifer
5. Retiring irrigated agricultural lands

The following discussion is provided for information purposes only and is not a plan for future action. The drainage obligation question is in litigation. It is inappropriate for the District to make a commitment to future drainage actions prior to resolution of the litigation.

Background

Since 1985, the District has studied a number of available or emerging drainage technologies, at a cost of over $8 million, none of which proved to be both technically and economically feasible. This includes land application, evaporation and solar ponds, biological selenium removal, a deep injection well, cogeneration, agro forestry, and upper zone pumping.

Source control efforts have proven successful in reducing problems in the drainage-impacted areas of the District. Sound water management by affected farmers has reduced deep percolation below the cropsô root zone and lessened the immediate impacts of the lack of artificial drainage. Westlands' Water Conservation Program has been actively involved in providing District farmers with information and assistance directed at achieving higher irrigation efficiencies and reducing deep percolation. This was the main emphasis in the Districtôs 1987-91 Irrigation Improvement Program which almost $1 million was provided to District farmers to obtain the services of irrigation consultants. Under this program, consultants evaluated the farmers' irrigation systems and management and made recommendations that were directed at increasing irrigation effectiveness and reducing deep percolation.

Results from the Irrigation Improvement Program as analyzed by District staff show that the deep percolation goal of 0.4 AF/Acre (AF/Ac) in the shallow groundwater areas has already been achieved as recommended by the San Joaquin Valley Drainage Project (SJVDP). Irrigation data analyzed in shallow groundwater areas of 20 feet or less and 5 feet or less show the average deep percolation to be about 0.4 AF/Ac and 0.2 AF/Ac, respectively. The District-wide deep percolation averages .47 AF/Ac as shown on Table 15 of this document.

Current Efforts

Currently two agro forestry demonstration projects, managed by the Westside Resource Conservation District, are being conducted on lands within the District. These projects concentrate subsurface drainage water by using it on salt tolerant trees and halophytes and finally use solar evaporation to reduce the saline water to salt. The San Joaquin Valley Drainage Plan set a goal of reusing drainage water to irrigate about 12,100 acres of salt-tolerant trees and halophytes with subsurface drainage water by 2040. A reprint of a November/December 1998 Irrigator article describing the status of one of these demonstrations follows:

Results at Diener's Red Rock Ranch Drainage Project Are Encouraging
Diener recognized for his commitment to good irrigation management
ñThe Westlands Irrigatorò, November/December 1998

Much attention has been focused on John Dienerôs Red Rock Ranch drainage/agro forestry demonstration -- and with good reason. The results from the three-plus year demonstration project showed the concept is working, and helped Diener earn the recent honor as named the California Grower Magazine/Center for Irrigation Technology Irrigator of the Year award.

Diener admits there still are some unanswered questions, but the reclamation of a previously saline field now planted to broccoli indicates the conceptôs success. Three years ago before tile drain lines were installed under the now-planted, 30-acre broccoli field, Diener tried to farm wheat. His yield was a dismal two tons of wheat and the salinity level of the soil was 10 units of electrical conductivity (EC) in the upper one-foot of the soil. Today, three years later, the EC is 1 unit in the upper portion of the soil -- an acceptable level for most vegetable crops and EC levels are down by as much as 50 percent in the next two-to-three feet of soil, said Diener. Next year, Diener plans to plant processing tomatoes on the field.

The tile drain lines were placed six-feet deep, 400-feet apart throughout the full 150-acre field. The field irrigated using the Districtôs surface water, with well water serving as a supplemental supply. Eucalyptus trees were planted along the western border of the field to help intercept regional subsurface drainage flows coming under his field. This helped reduce the subsurface drainage flows to a more manageable level.

Working with cost-share funds from a Bureau of Reclamation challenge grant, and with expertise from the Westside Resource Conservation District, U. S. Natural Resource Conservation Service (formerly the U.S. Soil Conservation Service), and the State Department of Water Resources, Diener embarked on the agro forestry concept that encompasses a whole section of land. The project was designed to tile one-quarter of land each year, beginning in 1995. The fields tiled in 1996 and 1997 are beginning to show similar progress as the first field, said Diener.

The other fields are on their way to raising salt-sensitive crops, but still are being reclaimed through alfalfa and safflower. This next year, Diener will be planting dehydrator onions on the field tiled in 1996.

All of the drainage water coming off these fields is collected at the low-end of the fields and is pumped to an adjacent 120-acre field. Commingled with the subsurface drainage flows are six-inches of the District's surface water and surface tail water return flows. This water is used to irrigate salt-tolerant sugar beets, alfalfa seed and crested wheat grass which is used for grass hay. Diener said this field showed "reasonably good yields," with the sugar beets producing 28 tons per acre at 15.5 sugar. The grass hay netted about five-tons per acre.

The next step in the process collects the subsurface drainage water which is used to irrigate 13 one-acre blocks of feed crops. At this point, the drainage water is about 8,000 to 9,000 parts per million total dissolved solids. In comparison, seawater is about 40,000 ppm TDS. Salt grass, a coastal type of Bermuda grass used for grass hay, is one of the varieties planted in this third step.

In the fourth step, salt-tolerant halophytes, like atroflex, salicornia, cord grass and iodine bush, are planted in an experimental basis. ñThe ease of management is the primary focus of selecting halophytes,ò said Diener. The idea is to enhance the salt concentration to about 25,000 ppm TDS of the drainage water entering the last stage in the solar evaporator.

The plastic-lined, two-acre solar evaporation field is the final stage of the process. The water is contained in the evaporation pond-type facility, equipped with sprinklers to disburse the water and accelerate evaporation, and to help keep any water from ponding. The idea is to keep any birds from visiting or nesting in the evaporator. The process has reduced the volume of water, so that all that is left is the salt. In addition, Diener has ideas on how to manage that.

The residual salt, a combination of sodium sulfate, has been tested in the making of high-quality glass. The salts also contain some boron and selenium, most of which has been reduced by as much as 60 to 80 percent through volitization by the crops.

Diener is hopeful the boron derived from the process can have a market on the west side. "Some of the areas in the District that are not irrigated with well water may actually have a boron deficiency. Many vegetable crops, like broccoli and cauliflower, need about three-to-four pounds per acre of boron," said Diener. ñWe may have a place to go with this stuff,ò he added.

Diener is hopeful that the research for uses of the salt and minerals will continue. ñWeôre reading the results as we get them, using the information to make the next move a right one,ò said Diener, whoôs motivated by a strong sense of stewardship for the productive west side soils and efficient use of water.

A study will be prepared next year on the results of the Red Rock Ranch project, with the hope that farmerôs and others will be able to use to process to help reclaim drainage-impacted areas. Diener hopes that funding will become available to help support four-or-five more of these drainage/agro forestry demonstration projects in other drainage areas. The sustainability of this project makes it so appealing for farmers, like Diener who do not have an outlet for their drainage water, as well as for farmers in the San Joaquin River/Grasslands drainage areas who must reduce selenium loads and address River water quality issues.

Land Retirement

In 1998 the USBR, with participation of the District, has established and funded a voluntary land retirement program established with the goal of retiring 15,000 acres of drainage affected lands. This program will retire the lands from irrigated production but the water will remain within the District with the land being dry land farmed. The San Joaquin Valley Drainage Plan set a goal of retiring 33,000 acres of drainage problem lands by 2040.

The USBR suspended this program due to insufficient environmental documentation. A draft EA/FONSI issued in 1999 calls for a 7,000-acre land retirement/project in Westlands Water District.

Urban Regional Criteria

There are no regional M&I criteria for this region.

Appendix A

Adopted: 7/20/87
Revised: 1/18/05

ARTICLE 2. REGULATIONS FOR THE ALLOCATION AND USE OF AGRICULTURAL WATER WITHIN WESTLANDS WATER DISTRICT

2.1 PURPOSE

Westlands Water District has long-term contractual and legal entitlements with the United States for a firm supply of 1,150,000 acre-feet (AF) of Central Valley Project (CVP) water during each water year. In some years, the District may acquire additional water pursuant to its entitlements, or other water. Pursuant to District Resolution No. 128-95, the Board of Directors has adopted the following Regulations establishing the rules and procedures for allocation and use of agricultural water.

2.2 GLOSSARY OF TERMS AND DEFINITIONS

A. agricultural water - water used for irrigation and other agricultural purposes.

B. Agricultural Water Allocation Application and Purchase Agreement (referred to as Allocation Application) - an agreement between the District and a water user which describes the land held by the water user, the amount of water requested by the water user, and which obligates the water user to accept and pay for all water supplied by the District.

C. allocation - amount of water ratably distributed from any source of supply to eligible District lands.

D. Area I - lands which formed a part of Westlands Water District on June 28, 1965 (the original Westlands area), as shown on Westlands Water District Dwg. No. 582, dated December 21, 1976, revised November 1, 1986, entitled ñAreas of Water Service Priority.ò

E. Area II - lands which formed a part of the original Westplains Water Storage District on June 28, 1965 (the original Westplains area), as shown on Westlands Water District Dwg. No. 582, dated December 21, 1976, revised November 12, 1986, entitled ñAreas of Water Service Priority.ò

F. Area III - lands which became a part of Westlands Water District after July 1, 1965 (the annexed area), as shown on Westlands Water District Dwg. No. 582, dated December 21,

1976, revised November 12, 1986, entitled ñAreas of Service Priority.ò

G. area entitlements - amount of contract water allocated for each District area.

H. contract water - any water obtained under the contractual and legal entitlements including additional and interim supplies.

I. cropland - irrigable acreage as determined by U.S. Consolidated Farm Service Agency (CFSA), formerly the ASCS, measurements.

J. cushion - water set aside for system losses and other uses.

K. entitlements - water provided pursuant to the contractual and legal obligations between Westlands Water District and the United States for water supply and distribution: 900,000 AF under the 1963 Contract and 250,000 AF of provisional water under the Barcellos Judgment.

L. furnish - to deliver or provide.

M. M&I use ï the use of water drinking, cooking, bathing, showing, dish wishing, and maintaining oral hygiene or purposes of commerce, trade or industry.

N. other water - water other than contract water.

O. overuse - use in excess of available supply.

P. per acre entitlement - ratable share of contract water:

> The Area I entitlement is 900,000 AF divided by the number of Area I cropland acres for which Allocation Applications are timely received; the Area II entitlement is 250,000 AF divided by the number of Area II cropland acres for which Allocation Applications are timely received.

Q. rescheduling - carryover of water for use in the next water year.

R. system gain - an increase in water available for allocation due to the difference in relative accuracy between state operated and maintained headworks meters and District operated and maintained water delivery meters.

S. system loss - either a direct loss or a reduction in water available for allocation because of the difference in relative accuracy between state operated and maintained headworks meters and District operated and maintained delivery meters.

T. transfer - assignment of water from one water user to another.

U. unused water - available supply at the end of the water year.

V. water user - landowner or lessee of land who has submitted and executed an Allocation

Application.

W. water year - each 12-month period that begins on March 1 and ends on the last day of February following.

2.3 CONTRACTUAL ENTITLEMENTS

A The entitlement of agricultural water for Area I is 900,000 AF less water set aside there from for M&I use, system losses, and other uses.

B. 1. The entitlement of agricultural water for Area II is 250,000 AF less water set aside there from for M&I use, system losses, and other uses.

2. Area IIôs entitlement will be supplemented by any amount of the Area I entitlement not timely applied for and purchased pursuant to these Regulations.

3. Any contract water in addition to the 1,150,000 AF in any water year shall be allocated to Area II until the average per acre allocation of contract water for all Area II eligible cropland is equal to the average per acre entitlement for all Area I eligible cropland.

C. No contract water shall be allocated to Area III until the allocation of contract water for eligible cropland in Areas I and II is equal to the per acre entitlement in Area I. Additional contract water then available to Area III will be allocated until the per acre allocation is equal to the per acre entitlement in Area I.

D. Any contract water in addition to the quantities described above will be allocated ratably on a per acre basis to satisfy timely applications first to eligible cropland in Areas I and II, then to eligible cropland in Area III, and finally on a first-come, first-served basis to all District cropland.

E. Prior to, and in conjunction with, the calculation of per acre entitlements in any water year, the General Manager shall set aside from the available water supply the amount of water for M&I use in accordance with Article __ of the Districtôs Rules and Regulations, system losses, and other uses approved by the Board of Directors. The General Manager may later allocate this water according to these Regulations if it is no longer necessary for such purposes.

F. If the United States does not provide the District with a full supply of contract water, the shortage will be proportionately applied to the area entitlements.

G. If there is a reduction in the rate at which water can be delivered to the District because of operational or other limitations, each water userôs share of the delivery rate will be equitably adjusted as determined by the General Manager.

2.4 OTHER ALLOCATION RULES AND PROCEDURES

A. Other water obtained by the District shall be made available to all cropland in the District without regard to area priority and shall be allocated on a per acre basis, unless otherwise directed by the Board of Directors.

B. Allocations of water shall be increased or decreased as more or less water becomes available for distribution within the District.

C. 1. System loss will be deducted first from the water set aside in each Area for such purposes, and second, from individual allocations in direct proportion to the water used by each water user.

2. System gain shall be apportioned to each Area according to total use and ratably allocated to individuals on a per acre basis.

D. Other water made available to the District specifically for direct transfer to a water user shall be allocated to the water user for whom it was intended. This water may be used or transferred within or outside of the District at the discretion of the water user, subject to applicable state and federal laws and District approval, or any conditions of use placed on the water when it was first transferred into the District.

E. Notwithstanding any other provisions of the Regulations, water made available for specified purposes shall be distributed and used in accordance with such specified purposes.

F. All per acre allocations of water will be made on the basis of cropland acres as determined prior to the time of the allocation. Any changes to cropland acres will be used for future allocations only, and will not be used to adjust prior allocations.

G. In order to receive an allocation, all cropland must be eligible under Reclamation law and any applicable District Regulations.

2.5 APPLICATION FOR WATER

A. To receive an allocation of contract water for agricultural purposes in any water year, a

water user must timely apply by filing an Allocation Application at a designated District office annually on or before January 15. Applications received after January 15 shall not receive an allocation unless accepted by the General Manager. Applications received after January 15 that are so accepted by the General Manager shall only be entitled to receive a proportionate share of contract water made available to the District after the date of such late applicationôs acceptance.

B. The General Manager may require supplemental application(s) for additional contract water or other water made available to the District.

C. If more than one Allocation Application for the same parcel of land is timely received and there is a dispute between the applicants regarding who should receive the water, priority will be given to the landowner, if one of the applicants owns the land in question. If no applicant owns the land, priority will be given to the water user who can provide satisfactory evidence of the right to occupy the land and receive the water. A lease or written consent from the landowner is considered satisfactory evidence. If the dispute arises after the water has been allocated, remedy is limited to unused water.

D. Neither contract water nor any other water will be allocated to any land for which water charges or assessments, land-based charges, or any other money owed to the District have been delinquent for 30 days or more at the time the water is allocated.

2.6 USE AND TRANSFER OF WATER

A. No water may be transferred out of the District without District approval.

B. Contract or other water may be used on any eligible cropland within the District.

C. A water user may transfer his contract or other water to another water user in any area of the District. Such transfer shall be in writing on a form provided by the General Manager.

D. The District will not transfer water from a water user to another resulting from a change in ownership or lease of land. However, if land is transferred by a change in ownership or lease with the result that the water user no longer owns or leases any District land, the unused water shall be transferred to the water user to whom the ownership or leasehold of such land has passed unless a transfer of water is requested pursuant to these Regulations.

E. The General Manager may restrict or prohibit the use or transfer of water allocated to any

cropland if a dispute exists among landowners regarding the allocation or use of such water.

F. Water service shall be discontinued when a water user has exhausted his available water supply.

G. Each water user shall take reasonable steps to reuse or control tail water. The failure to do so shall constitute a waste of water.

H. The General Manager is authorized, after oral or written notice to the water user, to lock the delivery facilities of, or discontinue water service to, any water user who violates these Regulations or Terms and Conditions for Agricultural Water Service.

I. The unauthorized using, taking, or wasting of water is prohibited and may subject the water user to civil or criminal prosecution.

2.7 PAYMENT FOR WATER

No water, regardless of source, shall be made available for delivery, transfer, or any other use by a water user who fails to make required payments to the District, regardless of the source of the water userôs obligation for payment. Rules for payment are set forth in the Terms and Conditions for Agricultural Water Service and other agreements, if any, between the water user and the District.

2.8 YEAR-END PROCEDURES

A. After final water use and supply accounting is completed for the water year, the District will determine the amounts of unused water or overuse for each water user.

B. Unused water may be rescheduled if such a program is available.

C. A water user with unused water that cannot be rescheduled will not be relieved of the obligation to pay for the unused water. The rate paid for such unused water shall include the cost of the water and any applicable District costs.

D. A water user with overused will have his allocation of contract water in the following year reduced by the amount of his overuse, first from the area in which the overuse occurred and then from any area in which the water user has an allocation of contract water. If this water user is not a water user in the following year, the amount of overuse will be attributed to the cropland that had been farmed by the water user. Further, any

allocation of contract water to that cropland will be reduced by the amount of overuse attributable to such cropland.

2.9 MISCELLANEOUS

A. The General Manager is authorized and directed to do any and all things necessary to implement and effectuate these Regulations.

B. An appeal from any decision made pursuant to these Regulations may be made to the Finance and Administration Committee of the Board of Directors. Such appeal shall be in writing and shall be filed with the District Secretary within 15 working days after notice of the decision. The decision of the Finance and Administration Committee may be appealed to the Board of Directors. Such appeal shall be in writing and shall be filed with the District Secretary within 15 working days after notice of the decision. The decision of the Board shall be final.

C. The General Manager shall provide notice of any changes or revision to these Regulations to all District landowners and water users.

Appendix B

WESTLANDS WATER DISTRICT

OFFICE--3130 N. FRESNO STREET/MAILING--P. O. BOX 6056, FRESNO, CA 93703
TELEPHONE: WATER ORDERS (209) 241-6250/OTHER (209) 224-1523/FAX (209) 241-6276

TERMS AND CONDITIONS FOR AGRICULTURAL WATER SERVICE

1. The allocation and furnishing of water shall be subject to all regulations of the Board of Directors of the District as the same may exist now or hereafter be amended or adopted. In the event of a conflict between these terms and conditions and the regulations, the latter shall be controlling.

2. All water shall be delivered pursuant to a request by the water user for the delivery of a specific flow rate to a specific parcel of land. The request shall be made within the time and in the manner prescribed by the General Manager.

3. Water will be furnished by the District subject to the terms and conditions under which it is made available to the District including, but not limited to, the requirements of federal Reclamation law. The District will use its best efforts, to the extent that it has water and capacity available and taking into account the requirements of other water users to receive water from District facilities, to provide such water in the manner and at the times requested. The District may temporarily discontinue water service or reduce the amount of water to be furnished for investigation, inspection, maintenance, repair, or replacement of any of the Districtôs facilities. The District will give the water user notice in advance of such temporary discontinuance or reduction, except in case of emergency, in which event no notice need be given. In the event the District issues a notice to discontinue or curtail water use, and District facilities are required to be re-filled because the water user fails to discontinue or curtail such use within the prescribed time, the water shall pay an administrative charge established by the Board of Directors for each point of delivery in violation. No liability shall accrue against the District or any of its officers, directors, or employees for damage, direct or indirect, because of the failure to provide water as a result of system malfunctions, interruptions in service necessary to properly operate and maintain the water distribution system, or other similar causes which are beyond the District's reasonable control.

4. By taking delivery of water from the District, the water user assumes responsibility for, and agrees to hold the District harmless from, all damage or claims for damage which may arise from his use of the water after it leaves the Districtôs facilities. The water user further agrees that there are no intended third party beneficiaries established and nothing contained herein, expressed or implied, is intended to give to any person, partnership, corporation, joint venture, limited liability company or other form of organization or association any right, remedy or claim under or pursuant hereto, and any agreement or covenant required herein to be performed by or on behalf of the water user or the District shall be for the sole and excusive benefit of the water user or the District.

5. The water furnished by the District is not in a potable state and the District does not warrant the quality or potability of water so furnished. By taking delivery of water from the District, the water user assumes responsibility for, and agrees to hold the District harmless from, damage or claims for damage arising out of the non-potability of water furnished by the District.

6. All water will be measured by the District with meters installed, maintained, and calibrated by it and such measurements shall be final and conclusive.

7. Charges for agricultural water, hereinafter referred to as ñwater charges,ò shall be established by the Board of Directors. The water charges shall include District operation and maintenance costs and any other costs determined by the Board to be payable as part of the water charges. The water charges shall also include the applicable water rates required pursuant to the Reclamation Reform Act of 1982, the Central Valley Project Improvement Act of 1992, and the Judgment in Barcellos and Wolfsen, Inc., et al. v. Westlands Water District, et al., and Westlands Water District, et al. v. United States, et al., U.S. District Court, Eastern District of California, Nos. CV-79-106-EDP and CV-F-81-245-EDP, respectively. Water charges shall be adjusted retroactively to the extent required and authorized by federal or state law or regulations or District regulations. The General Manager may adjust the water charges as necessary and legally authorized to account for increases or decreases in the estimates used to establish the water charges.

8. Payments for water service shall be due the 25th day of the month or 15 calendar days after the monthly bill for such service is mailed, whichever is later. Payment for the ñWater Allocationò component of the Districtôs annual repayment obligation to the United States shall be due on July 25. Notwithstanding the foregoing, for those water users who are subject to advance payment, payment for water services shall be due on the 25th day of the month preceding the use of water; provided, that for water allocated prior to July 31, the due date shall be deferred to the earlier of the first day of water use or the 25th day of August; provided further, that in lieu of advance payment, the District, at its option, may accept in a form satisfactory to the General Manager a written guarantee from a recognized financial lending institution or an assignment of any and all charges to land in the District owned by the water user. When any deadline established herein falls on a Saturday, Sunday, or holiday, it shall be extended to the next working day. Payments postmarked on or before the due date shall be deemed to have been received by the due date. Charges not paid by the applicable due date shall be delinquent.

9. All payments shall be made at the District's Fresno Office.

10. Advance payment shall be required for the acquisition costs of water transferred into the District from other agencies, pump-in water, or any allocation resulting from the District being able to obtain other water, prior to the allocation of such water to water users. The advance payment will be due by a date to be established by the General Manager. Conveyance-related costs for such water will be billed to water users upon water use.

11. All claims for overcharges or errors must be made in writing and filed with the

District at its Fresno Office within 10 working days after the date the bill is received by the water user or landowner. In the event the water user or landowner files a timely written protest, the Districtôs Finance & Administration Committee shall consider the protest at its next regular meeting and notify the water user or landowner in writing of its decision. The Committee's decision shall be final, unless a written appeal to the Board of Directors is filed with the Secretary of the District within 15 working days after notice of the decision. In the event of an appeal, the decision of the Board shall be final. The filing of a protest or an appeal does not nullify the payment requirement or the Districtôs right to discontinue water service as provided in these terms and conditions. However, in the event the protest or appeal is sustained, the District will refund the amount of the overcharge and penalty, if any.

12. During any 12-month period, the penalty for a water userôs second delinquency shall be 2 percent of the delinquent charges, except as described hereinafter. The second delinquency shall be 5 percent and the penalty for a water userôs third and subsequent delinquency shall be 10 percent, on current charges due, excluding any penalties or interest imposed on delinquent charges from a prior month. The 2 percent penalty shall not be levied with respect to a water userôs first delinquency in any 12 month period if the delinquent payment is received by the District on or before the last working day of the month, but the delinquency shall continue to be the water userôs first delinquency for purposes of this paragraph. Delinquent charges shall bear interest at a monthly rate of 1½ percent. Interest shall not, however, accrue after the delinquent charges together with applicable penalties and interest have been added to, and become a part of, the annual assessment levied on the land by the District. All payments and credits shall be applied to the earliest delinquent charges.

13. At the time of filing, the Districtôs assessment book with the District Tax Collector, delinquent charges, together with applicable penalties and interest, may be added to and become part of the assessment levied by the District on the land which received the water or for which other water charges were incurred. If the water was not furnished, the applicable delinquent charges may be added to the land to which the water was allocated. The District shall notify the landowner of the anticipated amount(s) prior to adding the assessment. The added amount shall be a lien on the land and impart notice thereof to all persons. If the assessment becomes delinquent, penalties and interest will be added as provided by law.

14. To supplement the procedure described in Paragraph 13, the District may elect to file and record a Certificate of Unpaid Water Charges as provided in California Water Code Section 36729. This Certificate creates a lien in the amount of delinquent charges on any land owned, by the delinquent water user, or acquired before the lienôs expiration, within the recording County.

15. Agricultural water service shall not be provided to, nor shall a transfer of water be permitted to or form, any water user or parcel of land for which delinquent charges or assessments, regardless of the source of the water userôs or parcel of landôs obligation to the District or the nature of the Districtôs service for which the charges were imposed, and notwithstanding the fact that the delinquent charges including applicable penalties and interest, have been added to the assessment(s) on the parcel(s) for which they were incurred. Water

Service shall be discontinued on the 1st of the month following that in which charges or assessments become delinquent, or as soon thereafter as reasonably possible; provided, that when the 1st of the month falls on a Saturday, Sunday, or holiday, such service shall be discontinued on the next working day.

16. The General Manager may require that all current charges be paid before the transfer of remaining water will be allowed.

17. If a water userôs delinquent charges are delinquent for 30 days or more, or if a water userôs delinquent charges are added to the annual assessments on any lands within the District, or the procedure in paragraph 14 is implemented, the General Manager shall require, as a condition of resumption of water service, that advance payment of all water charges be made for the 12-month period immediately following resumption of service, according to a schedule to be determined by the General Manager. In lieu of advance payment, the District, at its option, may accept in a form satisfactory to the General Manager a written guarantee from a recognized financial lending institution.

18. The General Manager, after consultation with and approval by the Finance & Administration Committee, may also require advance payment and/or payment by cashierôs check or such other actions as he may deem necessary when a water userôs account is determined, based on the payment history or other actions of the water user, to create a financial risk or hardship for the District. Circumstances which constitute the basis for such a determination include but are not limited to the following: (1) instances of a water userôs checks being returned unpaid or (2) instances where a water user whose account is delinquent has, in violation of District regulations, taken water from a District delivery. In lieu of advance payment, the District, at its option, may accept in a form satisfactory to the General Manager a written guarantee from a recognized financial lending institution

19. As used in these terms and conditions, the term ñchargesò includes water charges, land-based charges and payments due the District under any lease or other agreement between the District and the water user.

20. Agricultural water service shall not be provided to any water user who has failed to file, or to any lands for which there has not been filed, the certification or reporting forms required pursuant to Reclamation law, and particularly the Reclamation Reform Act of 1982. Any water delivered in violation of this provision may be subject to charges and administrative fees pursuant to federal law or regulation.

21. Agricultural water service shall not be provided to any water user who fails to provide the District with crop information at the time(s) and in the form required by the General Manager.

22. By applying for or taking delivery of agricultural water from the District, the water user agrees to these terms and conditions of service.

23. The District may modify or terminate these terms and conditions; provided, that such modifications or terminations are prospective only and notice thereof is given prior to the effective date.

Appendix C

United States Department of Agriculture
Soil Conservation Service
Government Center--680 Campus Dr., Suite E, Hanford, CA 93230
Telephone: 559-584-9209/Fax: 559-584-8715

GENERAL SOIL MAP

Hanford Soil Survey Office-for West Fresno County SSA
By Kerry Arroues, Supervisory Soil Scientist, 11/23/93

WESTLANDS WATER DISTRICT

This general soil map shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretative purposes. Each of the broad groups and the map units in each group are described in the following pages. For further definitions of terminology used in these descriptions, use the table titled ñTERMINOLOGY USED IN SOIL SURVEY DATA ENTRY OR MANUSCRIPT EDITINGò. As usual, on an ongoing soil survey, all information is tentative and subject to revision.

Soil Association #1: Tachi-Armona-Gepford (1,000 acres)

These soils are very deep, poorly drained, saline-sodic soils on flood plains and in flood basins. Effective rooting depth of the crops commonly grown in the area is limited by a perched water table that is at a depth of less than 6 feet.

- -Tachi and Gepford soils have clayey textures with a high shrink-swell potential.
- -Armona soils have loamy textures and are stratified. Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands water District.

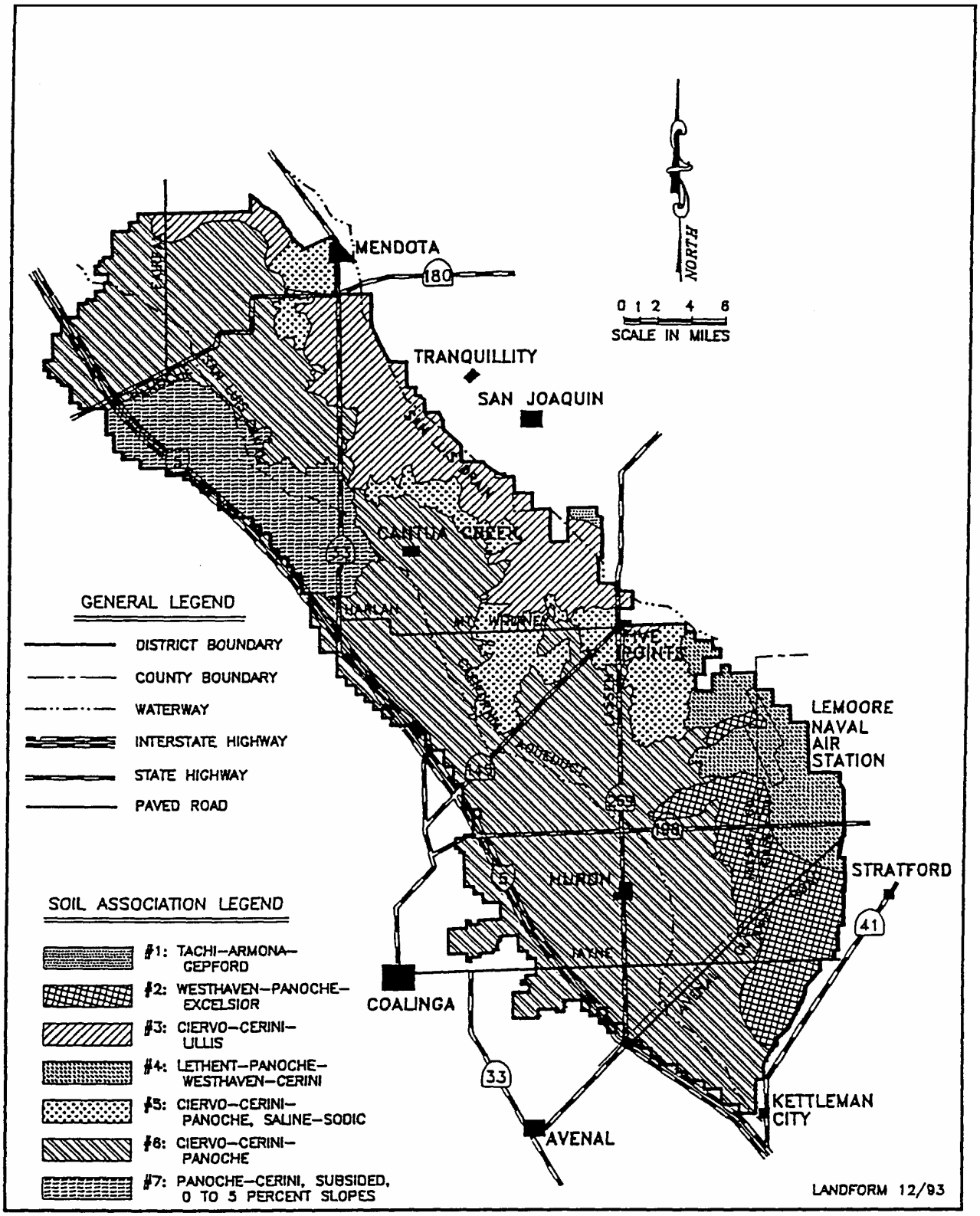


Figure 9: General Soil Map - Westlands Water District

If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table, very slow permeability and flooding. The high shrink-swell potential on the Tachi and Gepford soils should be considered before installing cement structures. High shrink-swell clay can cause cement structures to buckle.

Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil.

- Tile drainage can be used to lower the water table if a suitable outlet is available.
- Because of the very slow permeability on the Tachi and Gepford soils and stratification on the Armona soil, the application of water should be regulated so that water does not stand on the surface and damage the crops.
- The risk of flooding can be reduced by the use of levees, canals and diversions.

Soil Association #2: Westhaven-Panoche-Excelsior (47,000 acres)

These soils are very deep, well drained and moderately well drained soils on low lying alluvial fans and low fan terraces.

- Westhaven soils are stratified and have silty textures.
- Panoche soils have loamy textures.
- Excelsior soils are stratified and have coarse-loamy textures.

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District.

If this unit is used for irrigated crops, the main limitations are stratification and moderately slow permeability.

- The Westhaven and Excelsior soils are limited by a stratified profile that restricts permeability. Because of the moderately slow permeability of these soils, the length of runs should be adjusted to permit adequate infiltration of water. Good irrigation water management on these stratified soils requires that irrigation amounts and timing be adjusted to account for the available water capacity which can vary depending on the size, depth and texture of the strata.
- The Panoche soils have no major limitations.

Soil Association #3: Ciervo-Cerini-Lillis (72,000 acres)

These soils are very deep, moderately well drained to poorly drained, saline-sodic soils with a high perched water table on distal alluvial fans and low stream terraces.

- Ciervo soils have clayey textures which usually become coarser with depth.
- Cerini soils are stratified and have fine-loamy textures.
- Lillis soils are clayey with a high shrink-swell potential.

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands water District:

- If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table and slow permeability. The high shrink-swell potential on the Lillis soil should be considered before installing cement structures. High shrink-swell clay can cause cement structures to buckle.
- Intensive management is required to reduce the salinity and maintain soil productivity Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil.
- The Ciervo and Lillis soils have very slow permeability. The Cerini soil is limited by a stratified profile that restricts permeability and creates a perched water table. Because of the very slow and slow permeability of these soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.
- Tile drainage can be used to lower the water table if a suitable outlet is available.

Soil Association #4: Lethent-Panoche-Westhaven-Cerini (40,000 acres)

These soils are very deep, moderately well drained and well drained, saline-sodic soils on distal alluvial fans and flood plains. Much of this map unit has developed a high perched water table within 6 feet of the surface, especially near the northwest corner of Lemoore Naval Air Station.

- Lethent soils have clayey textures.
- Panoche soils have loamy textures.

- Westhaven soils are stratified and have silty textures.
- Cerini soils are stratified and have fine-loamy textures.

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District:

If this unit is used for irrigated crops, the main limitations are salinity and sodicity, a high perched water table, slow permeability and stratification.

- -Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil.
- Lethent soils have very slow permeability. Westhaven and Cerini soils have slow permeability. Panache soils have moderately slow permeability. Because of the moderately slow to very slow permeability of these soils, and stratification on the Westhaven and Cerini soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.
- Tile drainage can be used to lower the water table if a suitable outlet is available.

Soil Association #5: Ciervo-Cerini-Panoche (57,000 acres)

These soils are very deep, moderately well drained and well drained, saline-sodic soils on mid alluvial fans and flood plains. Some of this map unit has developed a high perched water table within 6 feet of the surface.

- Cierva soils have clayay textures which usually become coarser with depth.
- Cerini soils are stratified and have fine-loamy textures.
- Panoche soils have loamy textures.

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District:

If this unit is used for irrigated crops, the main limitations are salinity and sodicity, moderately slow permeability to very slow permeability, and a high-perched water table in some areas.

- Intensive management is required to reduce the salinity and maintain soil productivity. Gypsum, sulfur, and sulfuric acid are among the

soil amendments that can be used to reclaim this soil. If sulfur or sulfuric acid is used, lime should be present in the surface layer. Content of salts can be reduced by leaching, applying proper amounts of soil amendments, and returning crop residue to the soil.

- Ciervo soils have very slow permeability. Cerini soils have slow permeability. Panoche soils have moderately slow permeability. Because of the moderately slow permeability to very slow permeability of these soils, and stratification on the Cerini soils, the application of water should be regulated so that water does not stand on the surface and damage the crops.
- Where a perched water table within 6 feet of the surface is present, tile drainage can be used to lower the water table if a suitable outlet is available.

Soil Association #6: Ciervo-Cerini-Panoche (342,000 acres)

These soils are very deep, moderately well drained and well drained soils on alluvial fans and flood plains.

- -Ciervo soils have clayey textures, which usually become coarser with depth.
- -Cerini soils are stratified and have fine-loamy textures.
- -Panoche soils have loamy textures.

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District:

If this unit is used for irrigated crops, the main limitations are stratification on Cerini soils and slow permeability or moderately slow permeability.

- Ciervo soils have slow permeability. Cerini soils have moderately slow permeability. Because of the slow permeability on the Ciervo soils and moderately slow permeability and stratification on the Cerini soils, the application of water should be regulated so that water does not stand on the surface and damage the crops. Good irrigation water management on these soils requires that irrigation amounts and timing are adjusted to account for the available water capacity which can vary depending on the size, depth and texture of strata.

Soil Association #7: Panoche-Cerini, subsided, 0 to 5 percent slopes (45,000)

These soils are very deep, well-drained soils on alluvial fans and flood plains, which have subsided unevenly across the landscape due to near-surface subsidence.

- -Panoche soils have loamy textures.
- -Cerini soils are stratified and have fine-loamy textures

Effect on water operations and management and any limitations on agriculture resulting from soil problems within the Westlands Water District:

- If this unit is used for irrigated crops, the main limitations are near-surface subsidence, moderate hazard of water erosion, moderately slow permeability on the Cerini soil, and occasional flooding in low-lying areas. The near surface subsidence should be considered before installing cement structures. Subsidence can cause cement structures to buckle.
- -Sprinkler or trickle irrigation is best suited where subsidence has occurred near the surface. Hollow areas caused by subsidence make furrow and border irrigation more difficult. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff and erosion.
- -Because of the moderately slow permeability of the Cerini soil, the application of water should be regulated so that water does not stand on the surface and damage the crops. To avoid over-irrigating, applications of irrigation water should be adjusted to the available water capacity, the water intake rate and the crop needs.
- -Use of pipe, ditch lining or drop structures in irrigation ditches facilitates irrigation and reduces ditch erosion.
- -The risk of flooding can be reduced by the use of levees, canals and diversions.

Appendix D

Definitions of Irrigation Terms

Acre-Foot (AF): The volume of water required to cover one acre to a depth of one foot (43,560 cubic feet). An acre-foot equals 325,851 U.S. gallons.

Advance Ratio (AR): For furrow irrigation, the ratio of the total time irrigation water is applied to the furrow (set time) to the time needed for irrigation water to reach the lower end of a sloping furrow (advance time).

$$AR = \frac{SetTime}{AdvanceTime}$$

Annual Distribution Uniformity (ADU): See ñDistribution Uniformity.ò

Annual Irrigation Efficiency (AIE): See ñIrrigation Efficiencies.ò

Applied Water (AW): Water applied to a field by irrigation, excluding the tailwater which runs off the field and is collected for reuse in the irrigation of another field on that farm, expressed as a depth of water in inches or feet.

Available Soil Moisture: The difference in soil moisture content between Field Capacity and Permanent Wilting Point. This represents the moisture which can be stored in the root zone for use by crops, expressed as a depth of water in inches or feet (Israelson & Hanson, 1979).

Beneficially Used Water (BU): Irrigation water used to satisfy a portion or all of the following: evapotranspiration, leaching requirement, special cultural practices, and/or water stored in the soil for use by crops, expressed as a depth of water in inches or feet (ASAE, 1988; Burt, et al., 1988).

Conservation: ñ. . . planned management of a natural resource . . . .ò (Websterôs New World Dictionary, 1989.)

Crop Root Zone: The soil depth from which a mature crop extracts most of the water needed for evapotranspiration. The crop root zone is equal to effective rooting depth and is expressed as a depth in inches or feet. This soil depth may be considered as the rooting depth of a subsequent crop, when accounting for soil moisture storage in efficiency calculations (Burt, et al., 1988).

Crop Water Requirement (CWR): The infiltrated water required to grow a crop, expressed as a depth of water in inches or feet (Burman, et al., 1981).

$$CWR = ET - EP + LRD + CP$$

Cultural Practices (CP): Irrigation water which is used for necessary farming practices such as soil reclamation, climate control, crop quality,

and weed germination, expressed as a depth of water in inches or feet (Burt, et al., 1988).

Deep Percolation (DP): The amount of irrigation water that flows below the crop root zone and is unavailable for evapotranspiration, expressed as a depth of water in inches or feet (Merriam & Keller, 1978).

Depth of Water: The depth of a volume of water spread over a given area, expressed as a depth of water in inches or feet.

Distribution Uniformity (DU): The ratio of the average low-quarter depth of irrigation water infiltrated to the average depth of irrigation water infiltrated, expressed as a percent (ASAE, 1988).

Effective Precipitation (EP): That portion of rainfall that contributes to satisfying the evapotranspiration and/or leaching requirement of a crop, expressed as a depth of water in inches or feet (Burman, et al., 1981).

Electrical Conductivity (EC): The property of a substance to transfer an electrical charge and a measure of the salt content of water. ECw is the term used as a measure of the salt content of irrigation water, ECe is the term used as a measure of the salt content of an extract from a soil when saturated with water, expressed as decisiemens per meter (dS/m) (Doorenbos & Pruitt, 1984).

Evapotranspiration (ET): The amount of water loss over a period of time through transpiration from vegetation and evaporation from the soil, expressed as a depth of water in inches or feet (Doorenbos & Pruitt, 1984).

Evapotranspiration of Applied Water (ETAW): The portion of the total crop evapotranspiration that is satisfied by applied water, expressed as a depth of water in inches or feet (Central Valley Water Use Study Committee, 1987).

Evapotranspiration Potential (ETP): Evapotranspiration potential is a value calculated with a modified Penman equation and is equal to daily alfalfa evapotranspiration when the crop occupies an extensive surface; is actively growing, standing erect, and at least eight inches tall; and is well watered so that soil water availability does not limit evapotranspiration, expressed as a depth of water in inches or feet (Burman, et al., 1980).

Field Capacity: Depth of water retained in the soil after ample irrigation or heavy rain when the rate of downward movement has substantially decreased, usually one to three days after irrigation or rain, expressed as a depth of water in inches or feet (Doorenbos & Pruitt, 1984).

Groundwater Table: The upper boundary of groundwater where water pressure is equal to atmospheric pressure, i.e., water level in a bore hole after equilibrium when groundwater can freely enter the hole from the sides and bottom (Doorenbos & Pruitt, 1984).

Infiltration Rate: The rate of water entry into the soil expressed as a depth of water per unit of time in inches per hour or feet per day. The infiltration rate changes with time during irrigation (Burt, et al., 1988).

Irrigation Efficiencies: Irrigation efficiencies are used to determine the efficiency of replacing moisture in the soil profile and may be calculated for single or multiple irrigations and are the ratio of the depth of water stored to the depth of applied water. The equations for single and multiple irrigations are as follows:

1. Pre-irrigation Efficiency (PIE): This definition is used to calculate the efficiency of an on-farm pre-irrigation and is the ratio of the sum of the depth of water used for soil moisture replacement and cultural practices to the depth of applied water, expressed as a percentage (Burt, et al., 1988). No leaching requirement is included.

$$PIE = \frac{SMR_1 + CP_1}{AW_1} x100$$

2. Regular Season Irrigation Efficiency (RIE): This definition is used to calculate the efficiency of one or more regular season on-farm irrigations and is the ratio of the sum of the depth of soil moisture replacement water and water used for cultural practices for each irrigation after the pre-irrigation to the sum of the depths of water applied during these irrigations, expressed as a percentage. No leaching requirement is included (Burt, et al., 1988).

$$RIE = \frac{SMR_2 + CP_2 + SMR_3 + CP_3 + ... + SMR_n + CP_n}{AW_2 + AW_3 + ... + AW_n} x100$$

3. Annual Irrigation Efficiency (AIE): This definition is used to calculate the efficiency of all on-farm irrigations and is the ratio of the sum of the depth of soil moisture replacement water and water used for cultural practices for all irrigations plus the water to satisfy the seasonal leaching requirement to the sum of the depths of water applied during all irrigations, including the pre-irrigation, expressed as a percentage (Burt, et al., 1988).

$$AIE = \frac{SMR_1 + CP_1 + SMR_2 + CP_2 + ... + SMR_n + CPR_n}{AW_1 + AW_2 + ... + AW_n} x100$$

Where n = total number of irrigations, n = 1 is the pre-irrigation.

Leaching Fraction (LF): The ratio of deep percolation (DP) to infiltrated irrigation water (V_{iw}), V_{dp}/V_{iw}. It is the fraction of water that enters the root zone by irrigation that is not used in ET and which passes below the root zone as deep percolation (Rhoades, 1991).

Leaching Requirement (LR): The theoretical amount of infiltrated irrigation water that must pass (leach) beyond the root zone in order to keep soil salinity within acceptable levels for sustained crop growth. Different models may be used to estimate LR. For uniform and no rainfall conditions, a simple estimate is:

$$LR = \frac{ECw}{5ECe - ECw}$$

Where ECw is the electrical conductivity of the infiltrated irrigation water and ECe is the maximum EC of the saturated extract of the soil tolerable (not causing significant yield loss) by the crop in question. Actual leaching needed for salinity control may be more or less than this estimate dependent upon uniformity of irrigation/infiltration and amount and distribution of rainfall, respectively.

Leaching Requirement Depth (LRD): The depth of water corresponding to the leaching requirement including extra water for non-uniformity in distribution.

$$LRD = \frac{ETAW}{(DU \div 100)} x \frac{LR}{(1 - LR)}$$

Low Quarter Depth: The average depth of water infiltrated into the quarter of the field infiltrating the least amount, expressed in inches or feet.

Minor Losses (ML): Water losses due to evaporation during irrigation, uncollected surface runoff from the field, and on-farm conveyance and storage systems expressed as a depth of water in inches or feet.

Permanent Wilting Point (PWP): The moisture remaining in a soil at a uniform soil moisture tension of about -15 bars of atmospheric pressure, which is the approximate tension at which plants irreversibly wilt due to moisture stress, expressed as a depth of water in inches or feet.

Pre-irrigation: An irrigation that occurs prior to the planting of a crop.

Pre-irrigation Efficiency (PIE): See ñIrrigation Efficiencies.ò

Regular Season Irrigation Efficiency (RIE): See ñIrrigation Efficiencies.ò

Salt Balance: The condition when the amount of salts added to a soil profile through irrigation and the amount removed by leaching are equal (i.e., no net gain nor loss of salt in the crop root zone). This balance will be established if adequate leaching occurs each year; the average root zone salinity at equilibrium will depend upon the amount of leaching and the

quality of the applied water (Hoffman, et al., 1980).

Seasonal Application Efficiency (SAE): This term measures the efficiency of applied irrigation water based on crop water requirements, where evapotranspiration is estimated using a modified Penman equation and crop coefficients and is expressed as a percentage.

$$SAE = \frac{BU}{AW} x100 = \frac{CWR}{AW} x100$$

$$CWR = ET - EP + LRD + CP$$

Soil Moisture Deficit (SMD): The amount of water needed to refill the crop root zone to field capacity at the time of irrigation, expressed as a depth of water in inches or feet (Westlands Water District, 1985).

Soil Moisture Replacement (SMR): The amount of water that is used to replace a portion or the entire soil moisture deficit, expressed as a depth of water in inches or feet.

Tailwater: Applied irrigation water that runs off the lower end of a field. Tailwater is the average depth of runoff water, expressed in inches or feet.

Under-irrigation (UI): The difference between the water actually stored in the crop root zone during irrigation (soil moisture replacement) and the water needed to refill the root zone to field capacity (soil moisture deficit) in all or part of the field, expressed as a depth of water in inches or feet.

Appendix E

WESTLANDS WATER DISTRICT

GROUNDWATER MANAGEMENT PLAN

Introduction

It is the mission of Westlands Water District to provide a timely, reliable, and affordable water supply to its landowners and water users, and to provide drainage service to those lands that need it. To this end, Westlands is committed to the preservation of its federal contract, which includes water and drainage service, and to the acquisition of additional water necessary to meet the needs of its landowners and water users.

In recognition of the vital nature of the Districtôs groundwater resources as part of the total water supply available to landowners and water users, and in light of federal, state, and local issues impacting, or potentially impacting, those resources, the Districtôs Board of Directors has authorized by Resolution (attached hereto as Appendix A), the preparation of a Groundwater Management Plan (Plan).

Authority

AB 3030, the Groundwater Management Act, authored by Assemblyman Jim Costa, became law on January 1, 1993, and was codified as Part 2.75, commencing with Section 10750 of Division 6 of the Water Code. AB 3030 permits local agencies to adopt programs to manage groundwater. The Central Valley Project Improvement Actôs criteria for evaluating water conservation plans, require all water suppliers overlying a usable groundwater basin to initiate development of a groundwater management plan pursuant to AB 3030.

AB 3030 allows any local public agency which provides water service to all or a portion of its service area and whose service area includes all or a portion of a groundwater basin to adopt a groundwater management program. The law contains 12 components, which may be included in a groundwater management plan. Each component may play some role in evaluating or operating a groundwater basin so that groundwater can be managed to maximize the total water supply while protecting groundwater quality.

The District is authorized to adopt rules and regulations to implement and enforce the Groundwater Management Program. The District may not limit or suspend extractions unless the District has determined through study and investigation that groundwater replenishment programs or other alternative sources of water supply have proved insufficient or infeasible to lessen groundwater demand. In adopting the rules and regulations, the District must consider the potential impact of those rules and regulations on business activities, including agricultural operations. In addition, to the extent practicable and consistent with groundwater resource protection, the District must minimize any adverse impacts on these business activities.

Before the District may levy a water management assessment or otherwise fix and collect fees for the replenishment or extraction of groundwater the District must hold an election on the proposition of whether or not the District shall be authorized to levy a groundwater management

assessment or fix and collect fees for the replenishment or extraction of groundwater. The District shall be so authorized if a majority of the votes cast at the election is in favor of the proposition.

Plan Objective and Goals

The Districtôs farmers, being good stewards of their land, are concerned about managing and protecting their resources, including groundwater. Therefore, the objective of this Plan is to preserve and enhance the long-term viability of the groundwater resources within the District with respect to both quantity and quality. To accomplish this objective the District intends to evaluate and/or implement programs, which are consistent with the mission statement of the District and will meet the following goals:

Primary Goals

- Preserve and enhance the reliability of groundwater resources of the District.
- Ensure the long-term availability of high quality groundwater.
- Maintain local control of groundwater resources within the District.
- Minimize the cost and impacts of groundwater use.

Secondary Goals

- Prohibit unrestricted export of groundwater from the District and use of groundwater to replace surface water removed from the District because of a transfer.
- Minimize impacts of groundwater pumping, including subsidence, overdraft, and soil productivity.
- Prevent unnecessary restrictions on the private use of the Districtôs groundwater resources.
- Ensure coordination between District, local, and regional groundwater management activities.
- Optimize use of groundwater storage conjunctively with surface water.
- Ensure efficient use of the Districtôs groundwater resources and minimize deep percolation and its contribution to the shallow groundwater problem through use of an effective water conservation and management program.
- Ensure that District water users understand the steps they can take to protect and enhance their groundwater supply.

Area to be Included in the Groundwater Management Plan

The Groundwater Program shall be effective throughout the entire District. It shall be the Districtôs policy to work cooperatively with all other agencies within the Westside Basin in order to facilitate protection and enhancement of the groundwater resources within the District and to avoid whenever possible duplicative or inconsistent groundwater management efforts. To that end, as a part of its Program, the District may enter into joint powers agreements or memoranda of understanding with public or private entities overlying all or a portion of the same groundwater basins as the Districtôs service area for the purpose of implementing or coordinating groundwater management activities.

Excluded from this Program will be the small domestic wells within the District boundaries which pump groundwater for single-unit residences.

District Background

Westlands consists of nearly 1,000 square miles of prime farmland between the Diablo Range of the California Coast Range Mountains and the trough, or lowest point, of the San Joaquin Valley in western Fresno and Kings Counties. Westlands averages 15 miles in width and stretches 70 miles from Mendota on the north to Kettleman City on the south. Figure 10 shows the general location of Westlands. Figure 11 is a map of Westlands in the western portion of the San Joaquin Valley.

Westlands was formed under California Water District Law in 1952 upon petition of landowners located within the Districtôs proposed boundaries. Nearly all land within the current Westlands' boundaries was at one time farmed using groundwater.

Negotiations between Westlands and the U.S. Bureau of Reclamation began on a contract to provide a dependable, supplemental supply of surface water through the Bureauôs Central Valley Project (CVP) shortly after the Districtôs formation. At that time, the federal government was considering the development and construction of the CVPôs San Luis Unit (SLU). This involved cooperation between the federal and state governments with regard to shared water storage facilities and conveyance systems.

When the original Westlands was organized, it included approximately 376,000 acres. In 1965, it merged with its western neighbor, Westplains Water Storage District, adding 210,000 acres. Additionally, lands comprising about 18,000 acres were annexed to the District after the merger to form the current 604,000-acre District. The original Westlands is referred to as Priority Area I and Westplains is referred to as Priority Area II, each under a separate CVP agricultural water service contract with the Bureau. Priority Area III currently does not have a firm surface water supply and receives water only when available from other sources including surplus CVP water transfers from within and outside the District.

Climate

Annual precipitation in Westlands averages about seven inches, the majority of which falls during the months of December through March. Summer maximum temperatures frequently exceed 100ę F and winter temperatures occasionally fall below freezing. With a mean annual temperature of 62ę F, the area has an average frost-free growing season of 280 days.

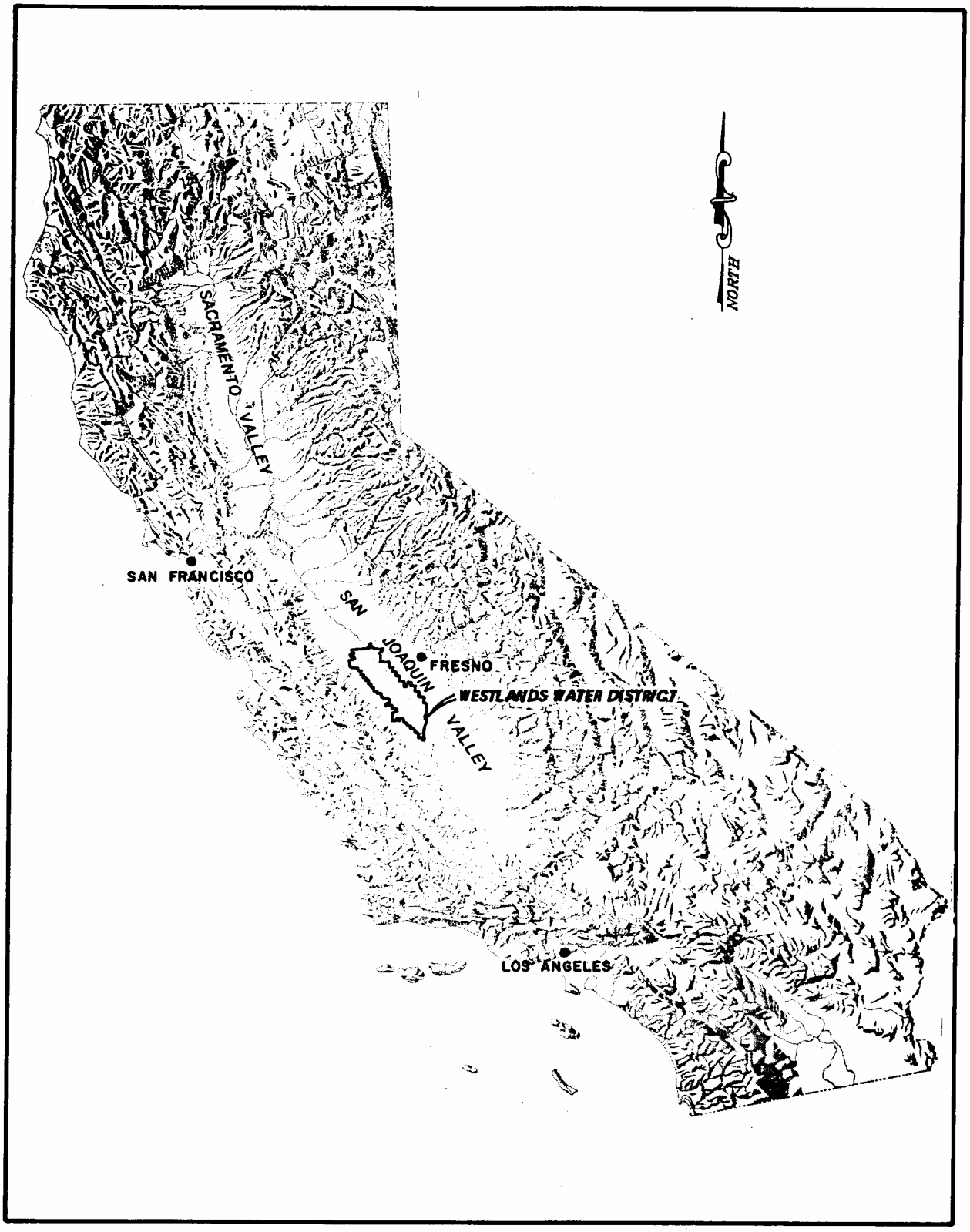


Figure 10: Location of Westlands Water District in California

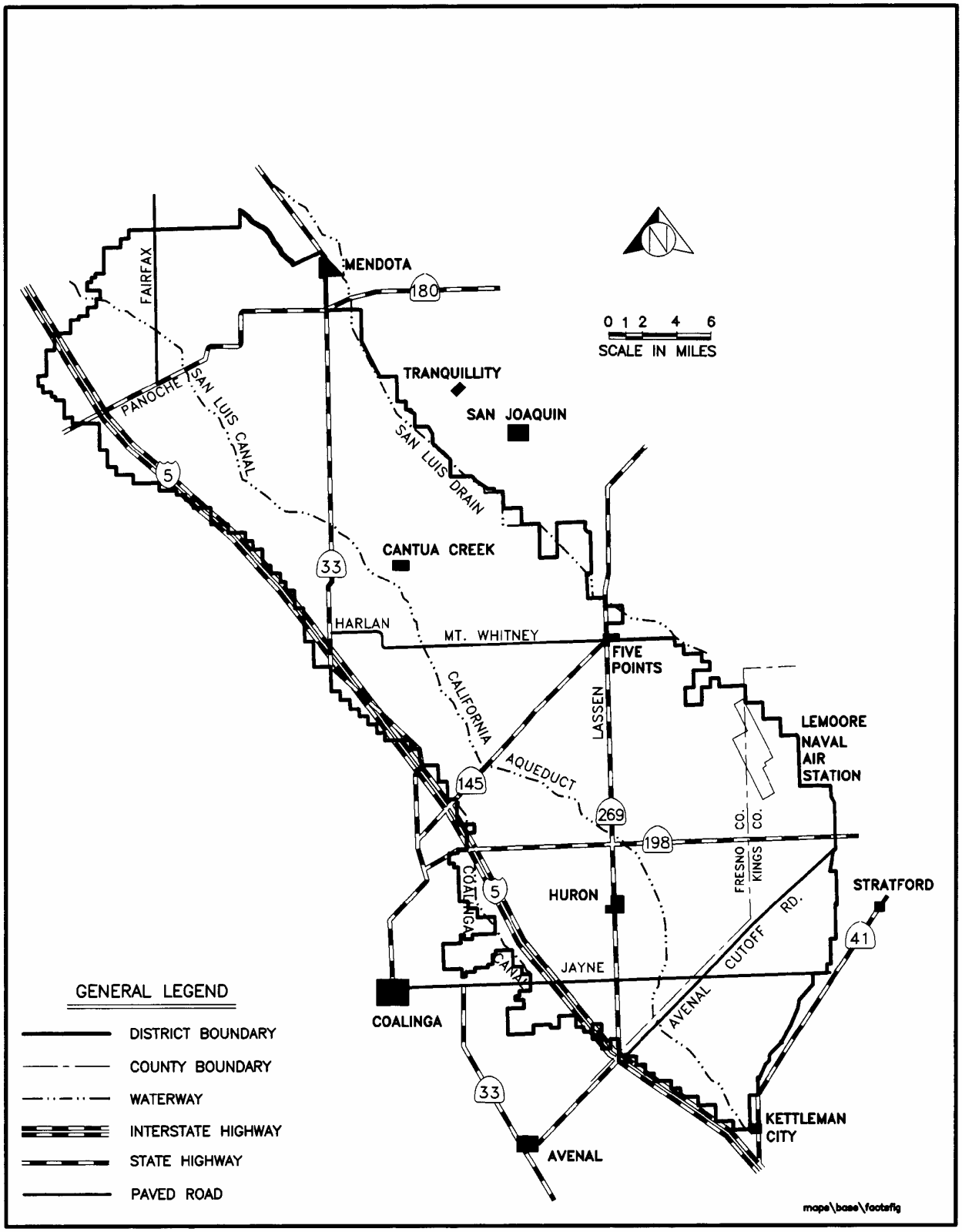


Figure 3: Westland Water District.

Geology

The San Joaquin Valley is a wide bedrock basin filled with thousands of feet of alluvial sediment deposited by streams and rivers flowing out of the adjacent mountains on both the east and the west. Westlands is located near the centerline of this basin, bordered on the east by the Fresno Slough and on the west by the Diablo Range of the California Coast Ranges.

The Diablo Range consists of complex, folded, and uplifted mountains, which are composed predominantly of sandstones and shales of marine origin. Eroded by creeks flowing from the Diablo Range, sediments form gentle sloping alluvial fans. The texture of the Diablo Range deposits depends on the relative position on the alluvial fan and ranges from coarse sand and gravel to fine silt and clay. Generally, those portions of Westlands lying high on the alluvial fans have permeable, medium-textured soils. With decreasing elevation from the west to east, soil textures become finer. These fine textured soils are characterized by low permeability and increased concentrations of water-soluble solids, primarily salts and trace elements.

The Sierra Nevada on the east side of the Valley is predominately comprised of uplifted granitic rock overlaid in areas by sedimentary and metamorphic rock. Sierran alluvial deposits in the District consist primarily of well-sorted sands, with minor amounts of clay. The Sierran alluvium decreases in thickness and increases in depth below the surface toward the west. These coarse-textured sediments are characterized by high permeability and a low concentration of water-soluble solids.

One of the principal subsurface geological features of the San Joaquin Valley is the Corcoran Clay formation. Formed as a lakebed about 600,000 years ago, this clay layer ranges in thickness from 20 to 200 feet and underlies most of the District. Varying depths from 200 - 500 feet in the Valley through to 850 feet along the Diablo Range, the Corcoran Clay divides the groundwater system into two major aquifersð a confined aquifer below and a semi-confined system above.

Westside Groundwater Basin

The groundwater basin underlying Westlands is comprised generally of two water-bearing zones: (1) an upper zone above a nearly impervious Corcoran Clay layer containing the Coastal and Sierran aquifers and (2) a lower zone below the Corcoran Clay containing the Sub-Corcoran aquifer. These water-bearing zones are recharged by subsurface inflow from the east and northeast, percolation of groundwater, and imported and local surface water. A generalized cross section of the District depicting the location of the Corcoran Clay and these water-bearing zones is shown in Figure 12.

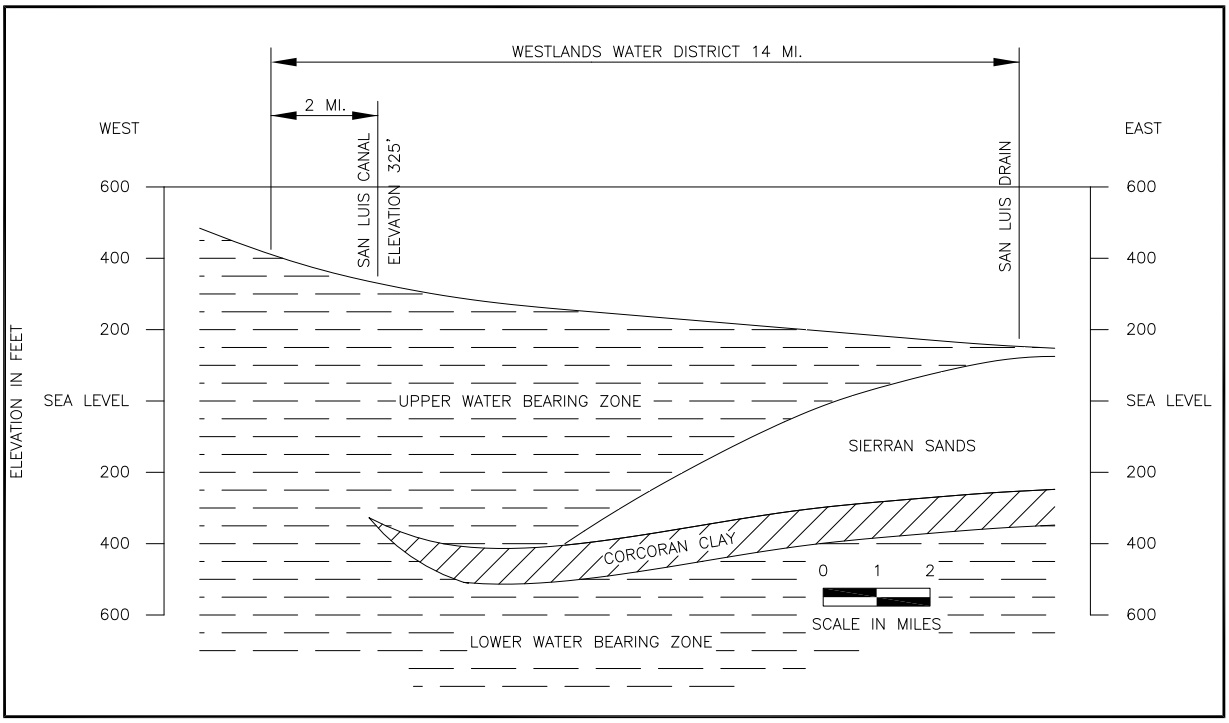


Figure 4: Generalized Hydrogeological Cross Section of Westlands.

The Corcoran Clay separates the upper and lower water bearing zones in the majority of the District. The Corcoran Clay is not continuous west of Huron. The elevation of the base of the Corcoran Clay is shown in Figure 13.

Groundwater quality in the lower water-bearing zone varies throughout the District as shown in Figure 14. Typically, water quality varies with depth, the poorest quality occurring at the upper and lower limits of the aquifer and the optimum quality somewhere between. The upper limit of the aquifer is the base of the Corcoran Clay. The USGS identified the lower limit as the base of the fresh groundwater. The quality of the groundwater below the base of fresh water exceeds 2,000 parts per million total dissolved solids. The elevation of the base of the fresh groundwater is shown in Figure 15.

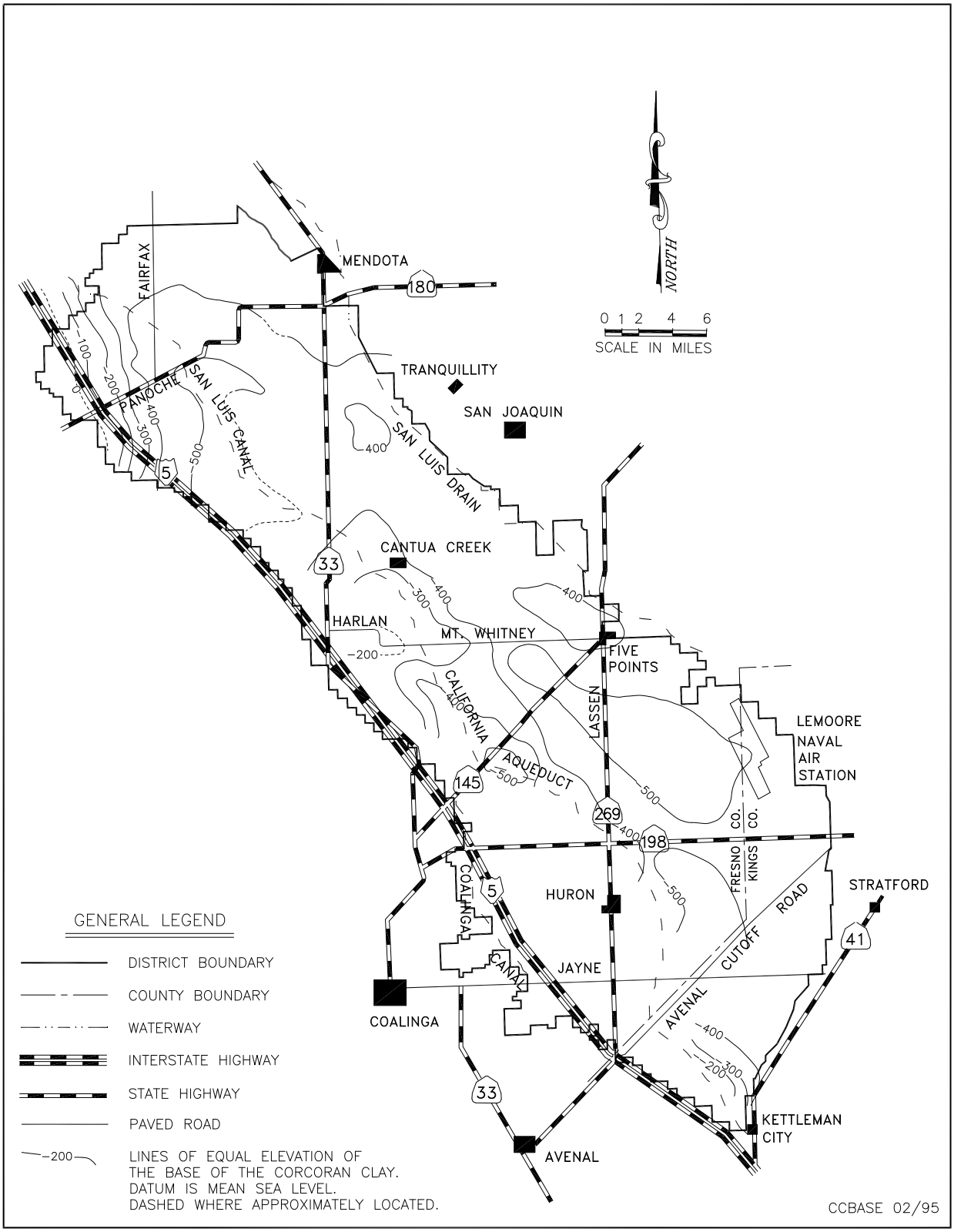


Figure 5: Elevation of Base of the Corcoran Clay.

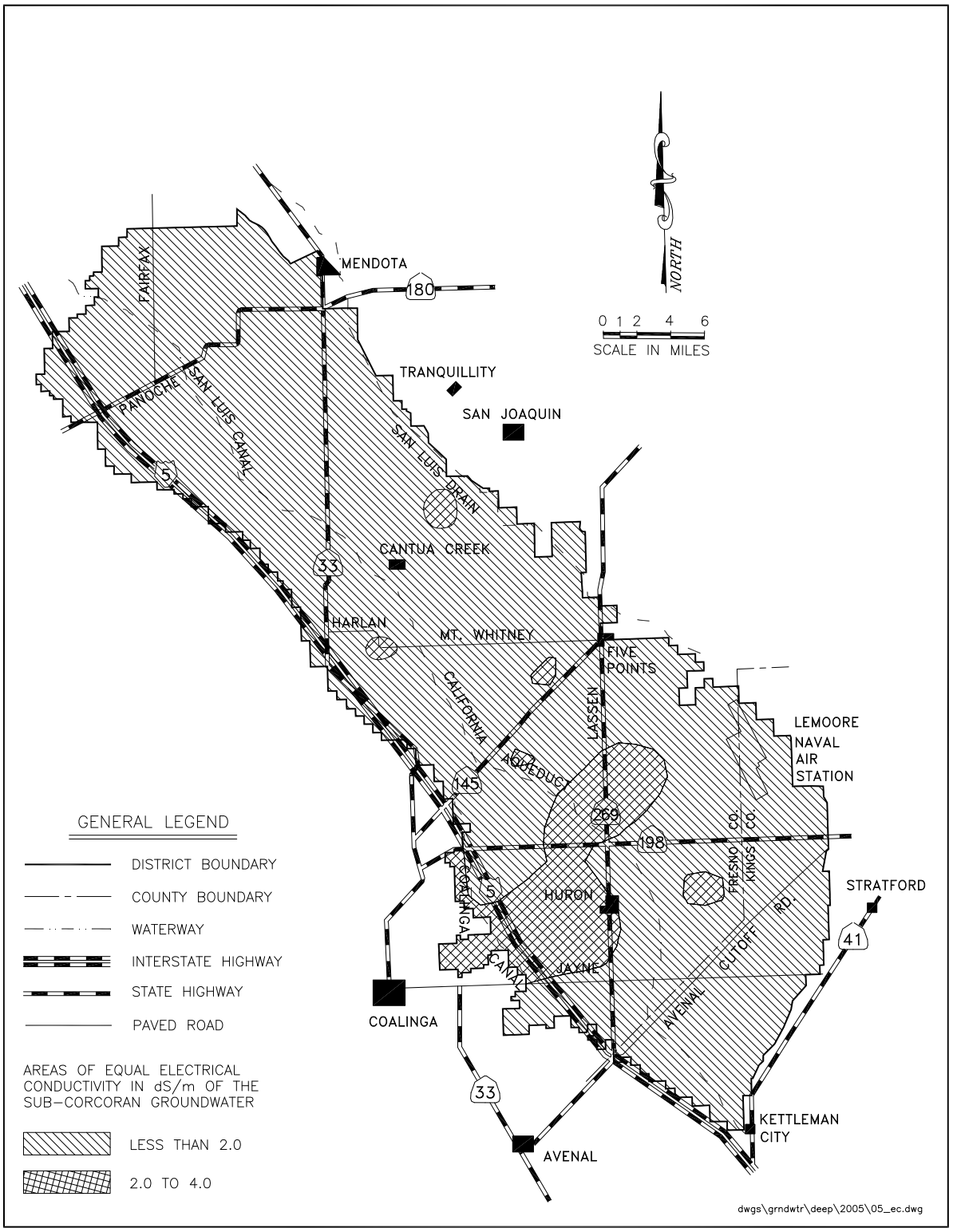


Figure 6: Electrical Conductivity of Sub-Corcoran Groundwater, December 2005.

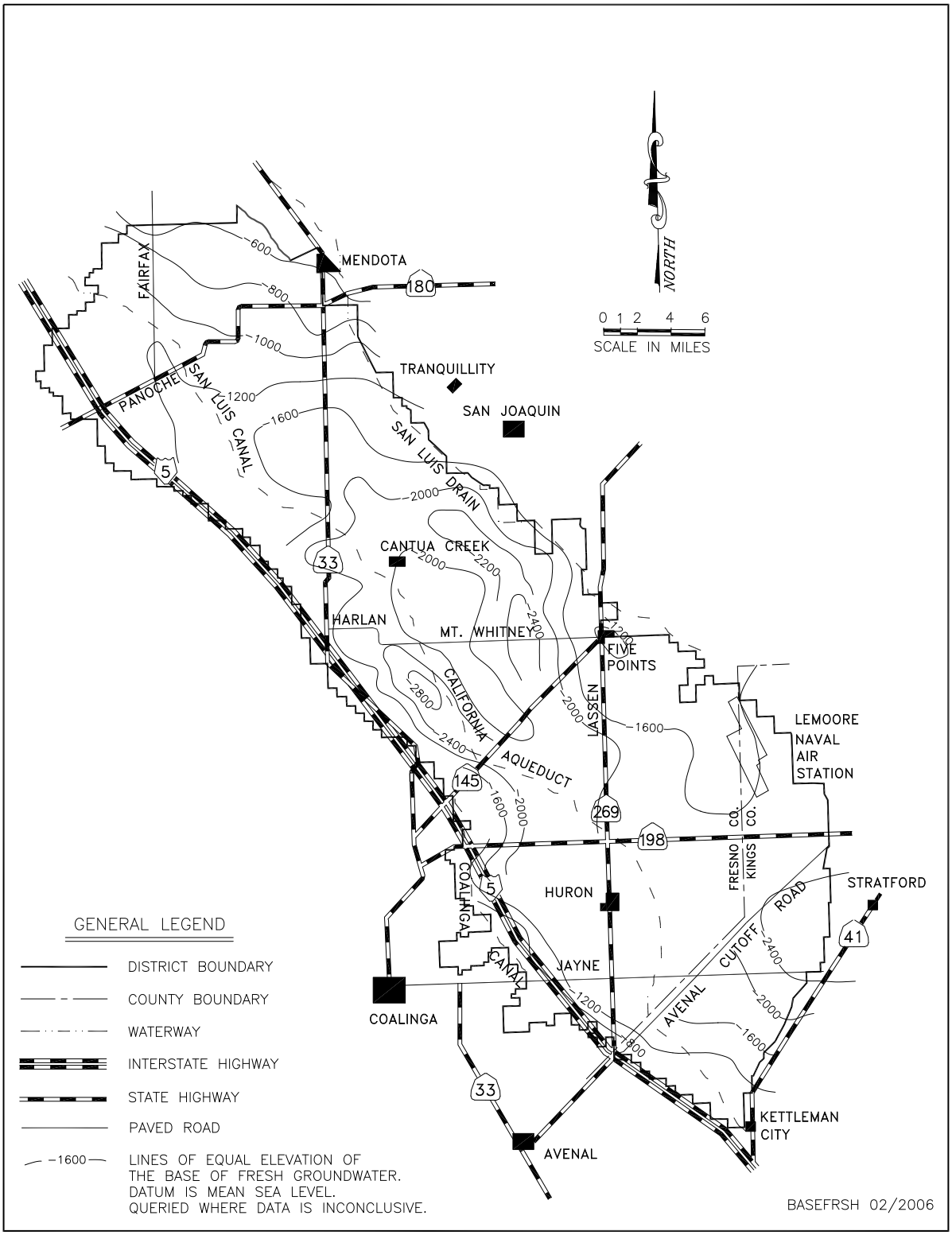


Figure 7: Elevation of Base of Fresh Groundwater.

Groundwater Monitoring Program

Project water supplies are carefully allocated and all surface deliveries are metered, yielding accurate water use data with which to manage the supply and recoup water delivery costs. Surface water quality is monitored by state and federal agencies and the District. On the other hand, pumping from private wells is at the discretion of the landowners.

Groundwater measurement and quality testing have proved useful to individual farmers to help them better manage water supplies, facilitate more accurate irrigation scheduling, monitor pump efficiency, and participate in District groundwater programs. Such measurement and testing also enable the District to better monitor groundwater supplies, calculate drought effects, and determine water needs.

The shortage of Project water since 1990 has necessitated the construction of many new wells so that groundwater could be used to help supplement surface supplies. More than 200 wells were drilled during the 1990-2001 period, bringing the total number of operational wells within the District to about 970. About 60 percent of the operational wells were metered in 1995. Many farmers participated in District Groundwater Exchange and Integration Programs during the 1990-94 period. These programs were implemented to increase the Districtôs available water supply and enhance the flexibility in the use of groundwater in terms of timing and location.

Groundwater monitoring is an essential part of managing any conjunctive use program. This information is vital to determine the effect of groundwater pumping on (1) groundwater overdraft, (2) water quality, (3) pumping costs, and (4) subsidence. Without effective monitoring, the short- and long-term impacts of conjunctive use programs cannot be assessed.

The wells located in Westlands are annually monitored for water level and water quality by District staff. This is done by sounding each well while in a static condition and measuring the electrical conductivity of the water while the well is operating. The results appear in various District reports and maps. This information enables the District to monitor groundwater trends, report the results to farmers, and estimate District-wide pumped groundwater quantities. This also enables the District to calculate seasonal application efficiency more accurately.

Groundwater Conditions

Prior to the delivery of CVP water to Westlands, the annual groundwater pumped ranged from 800,000 to 1,000,000 acre-feet (AF) during the period of 1950-1968. The majority of this pumping was from the aquifer below the Corcoran Clay causing the sub-Corcoran piezometric groundwater surface to reach the lowest recorded average elevation of more than 150 feet below mean sea level by 1968. The large quantity of groundwater pumped prior to delivery of CVP water compacted water bearing sediments and caused land subsidence, which ranged from 1 to 24 feet between 1926 and 1970 (U.S. Geological Survey, 1988).

With the beginning of CVP water deliveries in 1968, the groundwater surface rose steadily until reaching 89 feet above mean sea level in 1987, the highest average elevation of record dating back to the early 1940ôs. The only exception during this period was the increase in

pumping and accompanying drop in the groundwater surface elevation due to the 1977 drought and reduced CVP water supply. An increase in pumping to approximately 472,000 AF during 1977 caused a dramatic drop in the groundwater surface elevation of approximately 97 feet.

During the 1990ôs, groundwater pumped quantities have increased tremendously because of the reduced CVP water supplies caused by the extended drought and regulatory actions related to the Central Valley Project Improvement Act, the Endangered Species Act, and Bay/Delta water quality. Groundwater pumped quantities are estimated to have reached 600,000 AF annually during 1991 and 1992 when the District received only 25 percent of its contractual entitlement of CVP water. This increased pumping caused the groundwater surface to decline to 62 feet below mean sea level, the lowest elevation since 1977. Because of the groundwater pumping, increased subsidence occurred in the District and other areas in the western Central Valley. The Department of Water Resources estimated the amount of subsidence since 1983 to be almost two feet in some areas of the District with the most of that subsidence occurring since 1989.

An abundant surface water supply due to record precipitation in 1995 reduced the estimated quantity of groundwater pumped to 150,000 AF, allowing the average groundwater surface elevation to increase 78 feet to an average elevation of 27 feet above mean sea level. Overall, due to the mostly water-short years since 1990, the average piezometric water surface elevation has declined approximately 36 feet from December 1989 to December 1995. Another impact of reduced surface water deliveries is an increase in subsidence in areas of the Central Valley. The Department of Water Resources estimates the amount of subsidence since 1983 has been up to two feet in some areas of the District with the majority occurring since 1989.

From 1993 to 2000, CVP allocations to the District averaged 77% (820,664 acre-feet) and with reduced groundwater pumping 1996 ï 1999 allowed the groundwater surface elevation to increase from 1 foot to 43 feet, an increase of 42 feet. From 2001 to 2005, CVP allocations averaged 70% (802,179 acre-feet) and the groundwater surface increased 31 feet to an average elevation of 56 feet above mean sea level. With an increased CVP allocation of 100% (1,150,000 acre-feet) in 2006 and accompanying reduction in groundwater pumped, the groundwater surface increase 21 feet to an average elevation of 77 feet above mean sea level, the highest average elevation since 1987. Groundwater pumped for the last five years (2002 through 2006) totaled 665,000 acre-feet and would have been greater if the District and its water users had not transferred in other surface water supplies.

The estimated amount of groundwater pumped during 1976 - 2006 displayed in Table 33. The table also shows the average elevation of the groundwater in the lower water bearing zone and the average change in elevation from the prior year.

Table 33: Groundwater Pumped

Crop Year[28]	Pumped[29] AF	Elevation FT	Elevation Change FT	Crop Year	Pumping AF	Elevation FT	Elevation Change FT
1976	97,000	-2	9	1992	600,000	-62	-30
1977	472,000	-99	-97	1993	225,000	1	63
1978	159,000	-4	95	1994	325,000	-51	-52
1979	140,000	-13	-9	1995	150,000	27	78
1980	106,000	4	17	1996	50,000	49	22
1981	99,000	11	7	1997	30,000	63	14
1982	105,000	32	21	1998	15,000	63	0
1983	31,000	56	24	1999	20,000	65	2
1984	73,000	61	5	2000	225,000	43	-22
1985	228,000	63	2	2001	215,000	25	-18
1986	145,000	71	8	2002	205,000	22	-3
1987	159,000	89	18	2003	160,000	30	8
1988	160,000	64	-25	2004	210,000	24	-6
1989	175,000	63	-1	2005	75,000	56	32
1990	300,000	9	-54	2006	15,000	77	21
1991	600,000	-32	-41				

The average elevation of the Sub-Corcoran piezometric groundwater surface and the estimated amount of groundwater pumped in Westlands are shown in Figure 16.

[28] October 1 to September.
[29] District Estimates starting in 1988.

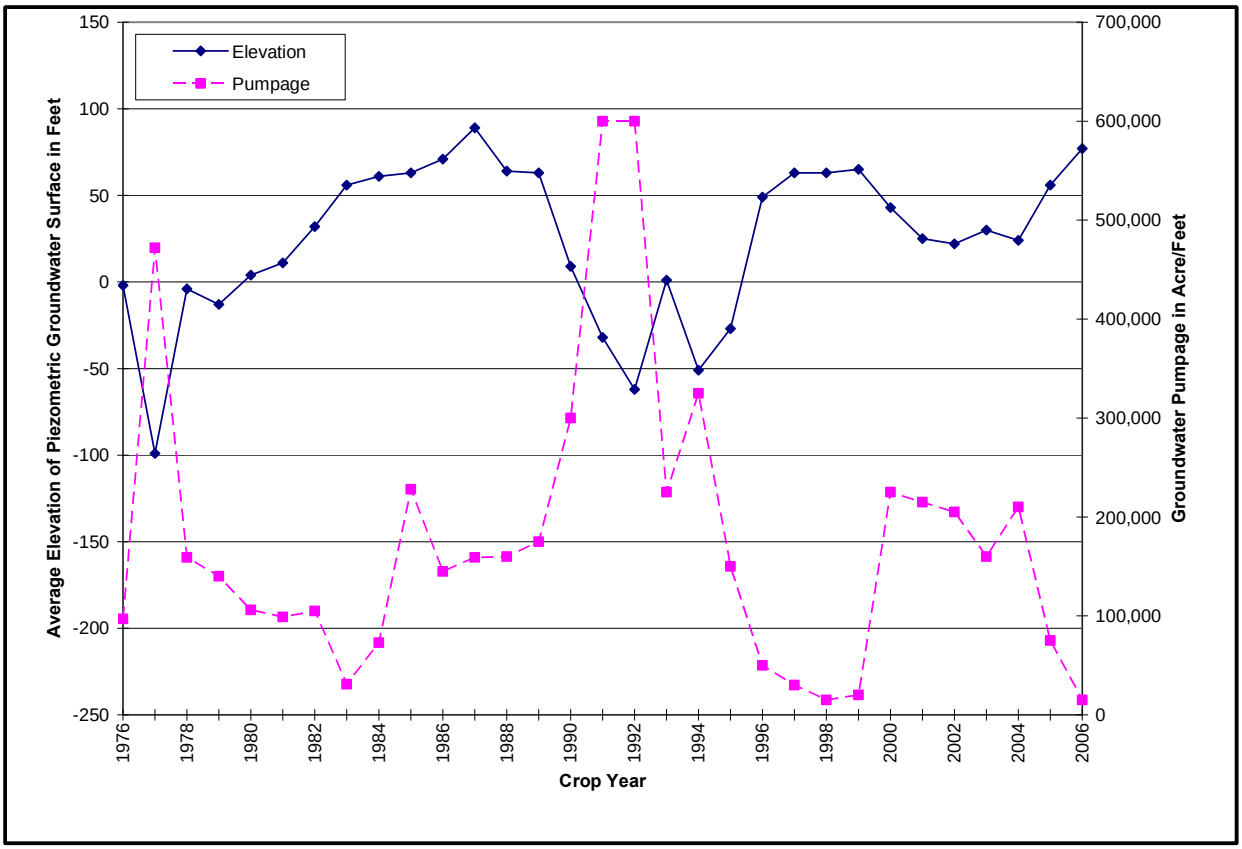


Figure 8: Historical Average Elevation of Sub-Corcoran Piezometric Groundwater Surface and Groundwater Pumped.

The depth to the piezometric groundwater surface in the lower water-bearing zone during December 1989, December 1994, and December 2006, showed in Figures 17, 18, and 19 respectively. The change in depth to the piezometric groundwater surface from December 1989 to December 1994 showed in Figure 20. The change in depth to the piezometric groundwater surface from December 1994 to December 2006 is shown in Figure 21.

In addition to monitoring the water levels of wells pumping from the lower aquifer, the wells pumping from the upper aquifer are also monitored. The majority of the wells pumping from the upper aquifer had groundwater surface levels 100 to 200 feet below ground surface during December 2006 as shown in Figure 22.

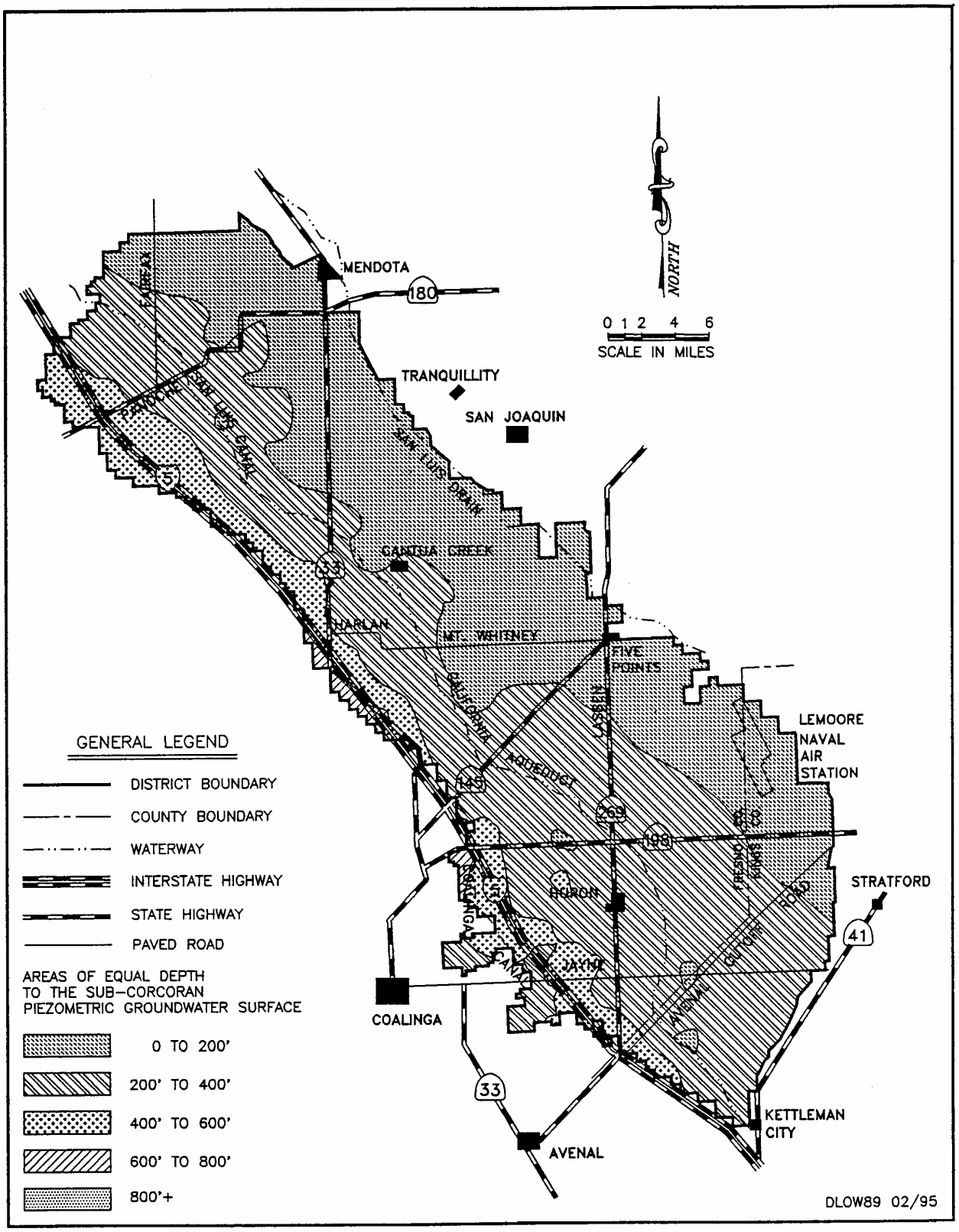


Figure 9: Depth to Sub-Corcoran Piezometric Groundwater Surface, December 1989.

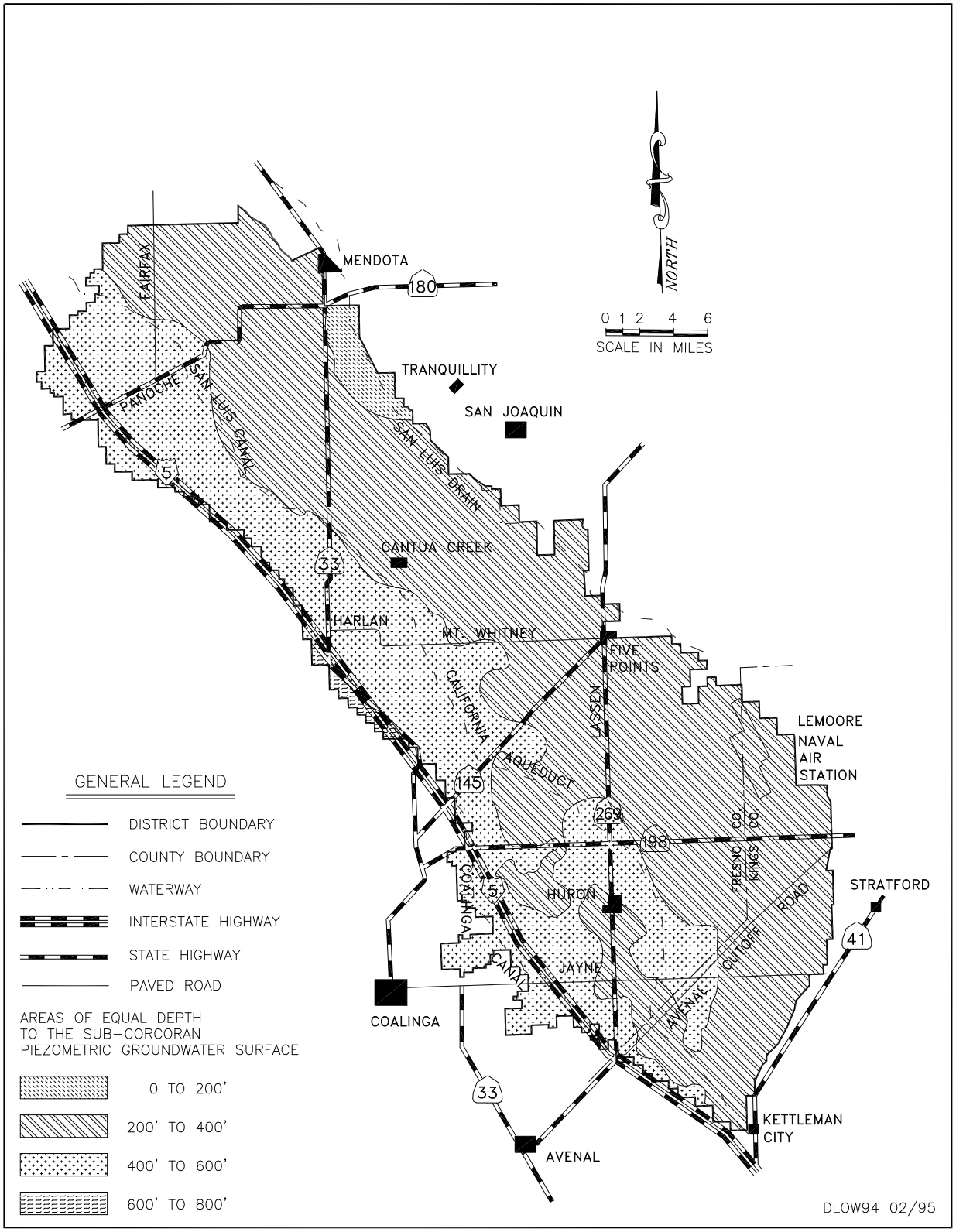


Figure 10: Depth to Sub-Corcoran Piezometric Groundwater Surface, December 1994.

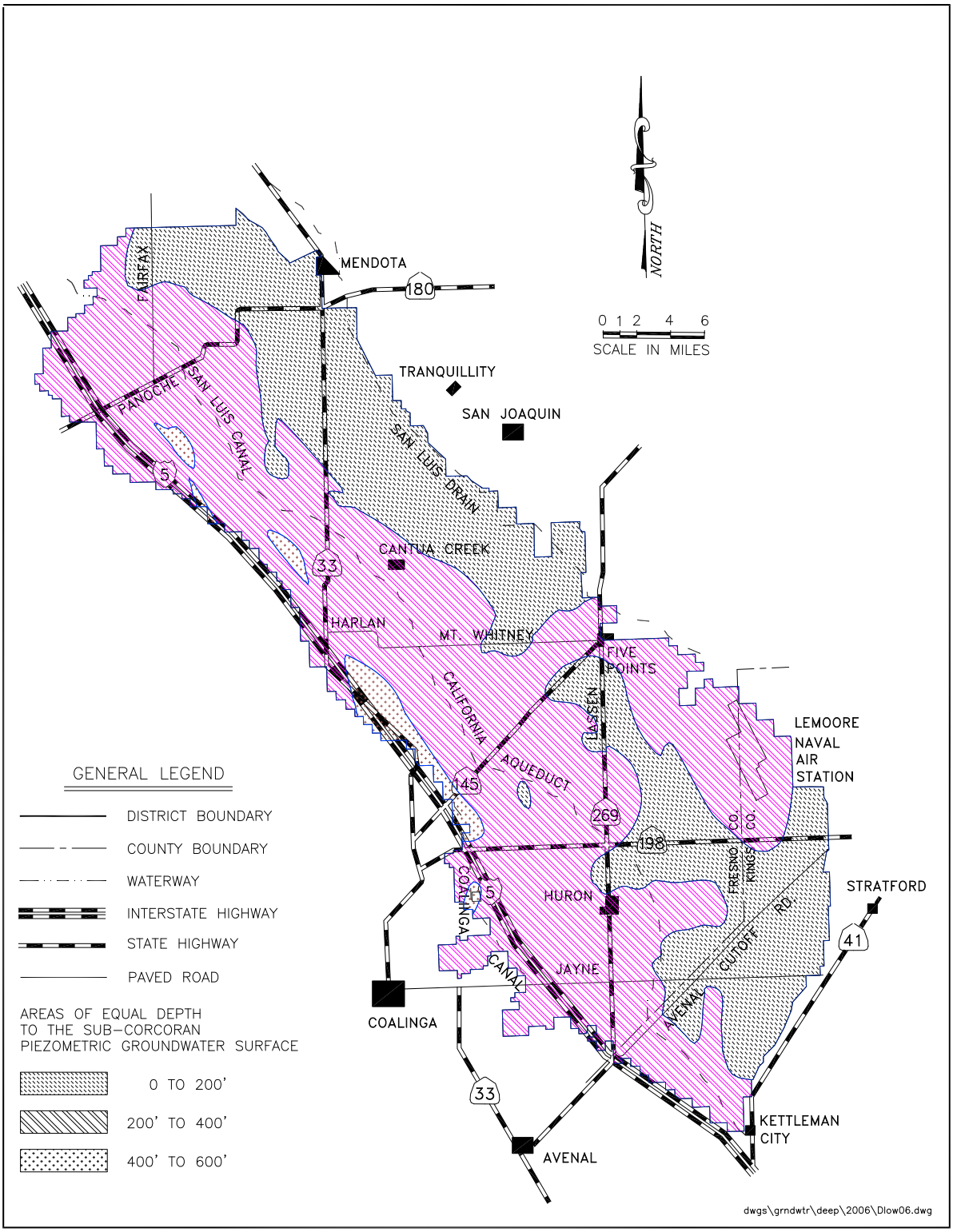


Figure 19: Depth to Sub-Corcoran Piezometric Groundwater Surface, December 2006.

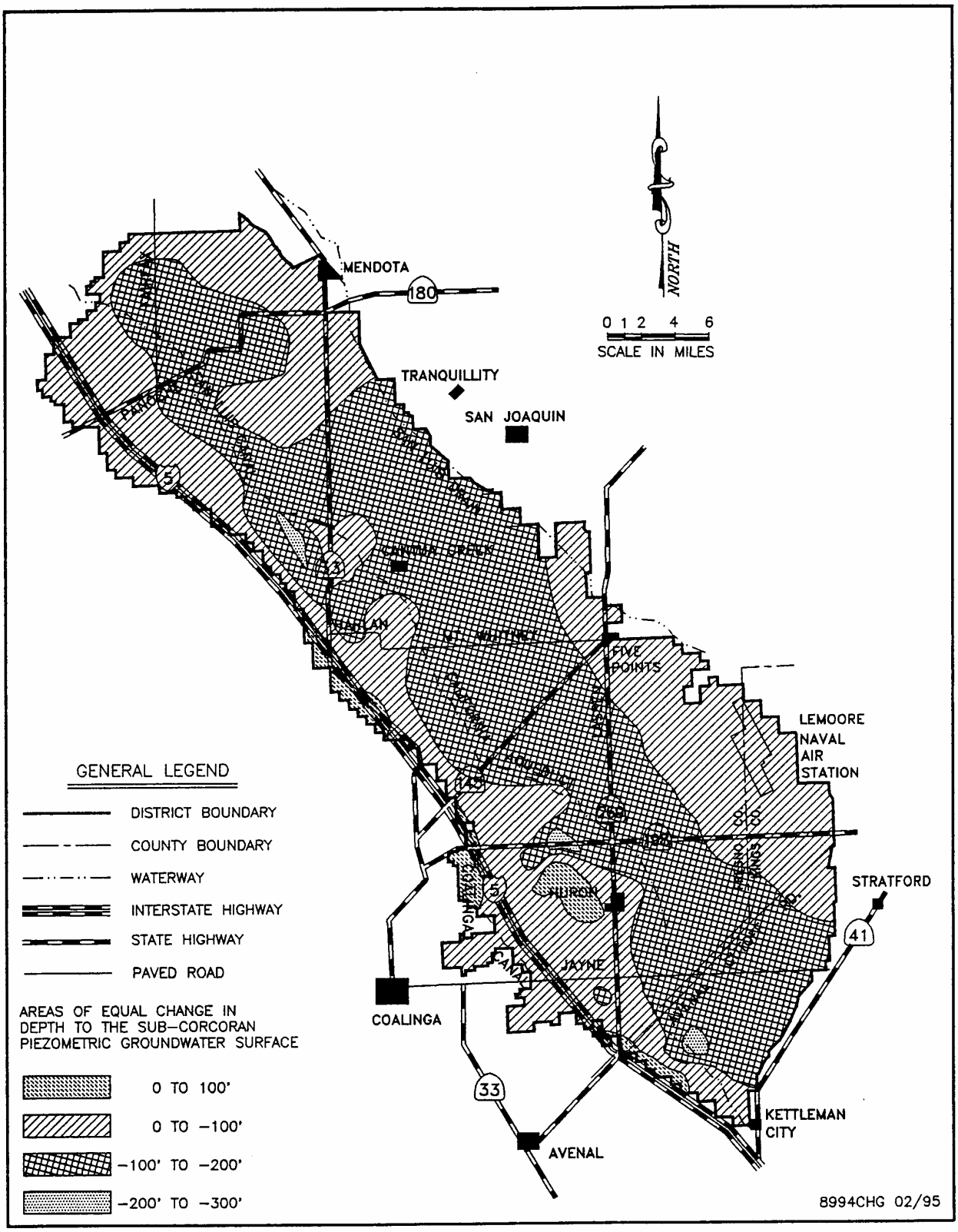


Figure 20: Change in Depth to Sub-Corcoran Groundwater, December 1989 to December 1994.

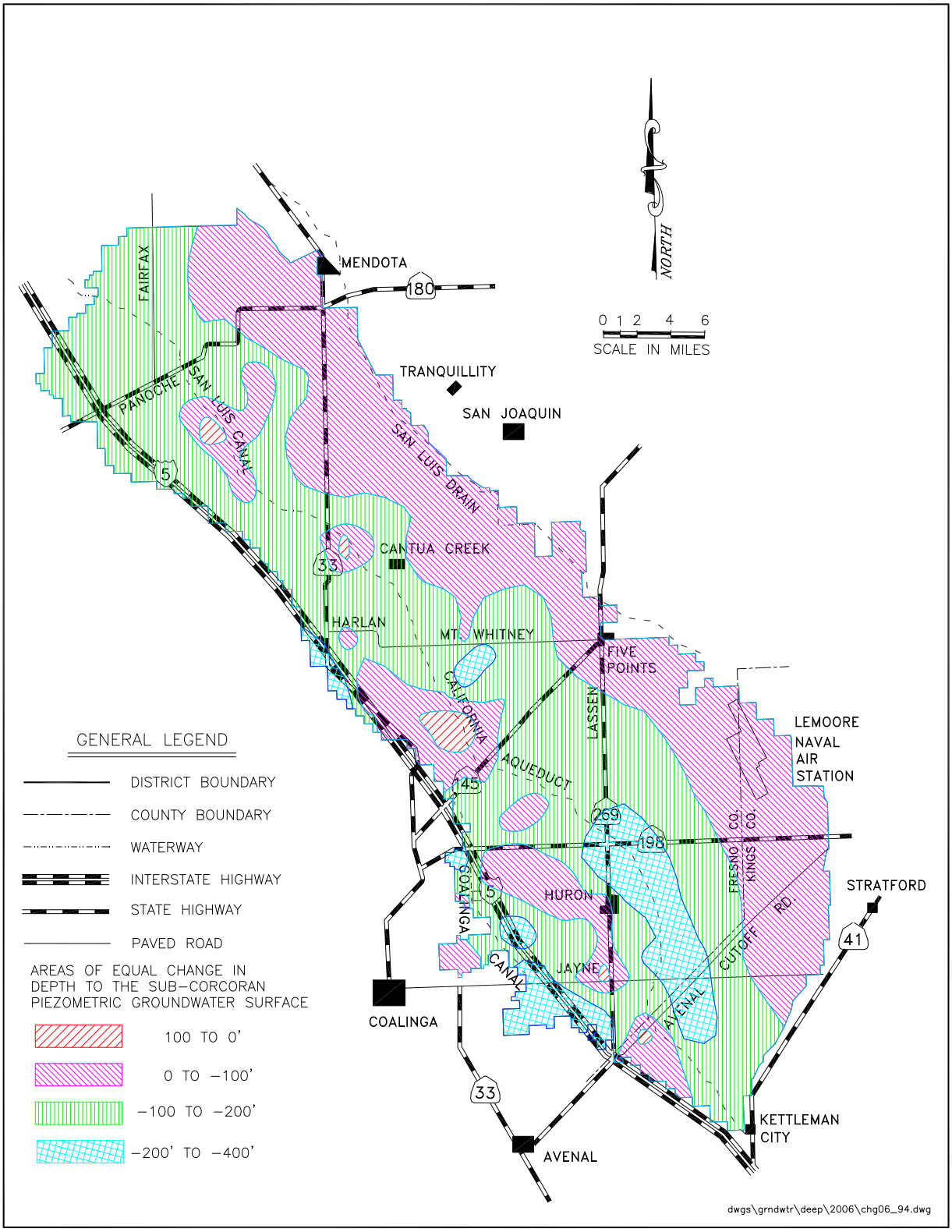


Figure 11: Change in Depth to Sub-Corcoran Groundwater, December 1994 to December 2006.

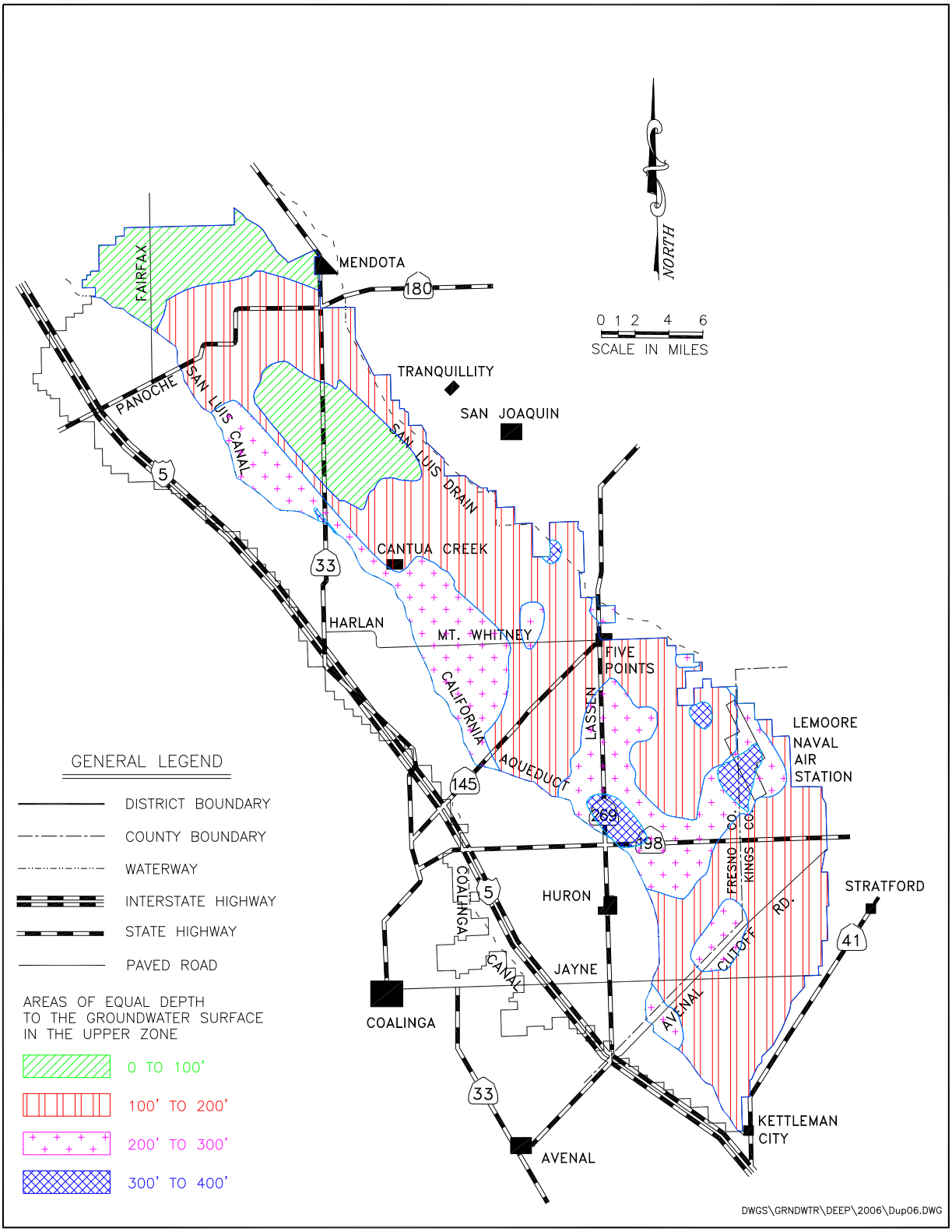


Figure 12: Depth to Groundwater in the Upper Zone, December 2006.

Safe Yield

Safe yield or current perennial yield is the maximum quantity of water that can be annually withdrawn from a groundwater basin over a long period of time (during which water supply conditions approximate average conditions) without developing an overdraft condition. Annual amounts of water extracted will vary below and above the perennial yield with water levels declining during times of increased pumping due to poor water supply conditions and water levels increasing or recovering during periods of decreased pumping, above normal precipitation, and good water supply conditions.

Current perennial yield can be estimated by plotting the amount of groundwater pumped in one year versus the average change in groundwater level in the basin for that year. Data for 1976 to present were plotted and a ñbest fit lineò was drawn. The intersection of the best fit line with the line showing zero groundwater level change as shown in Figure 23 indicates the current perennial yield of groundwater to be approximately 200,000 AF.

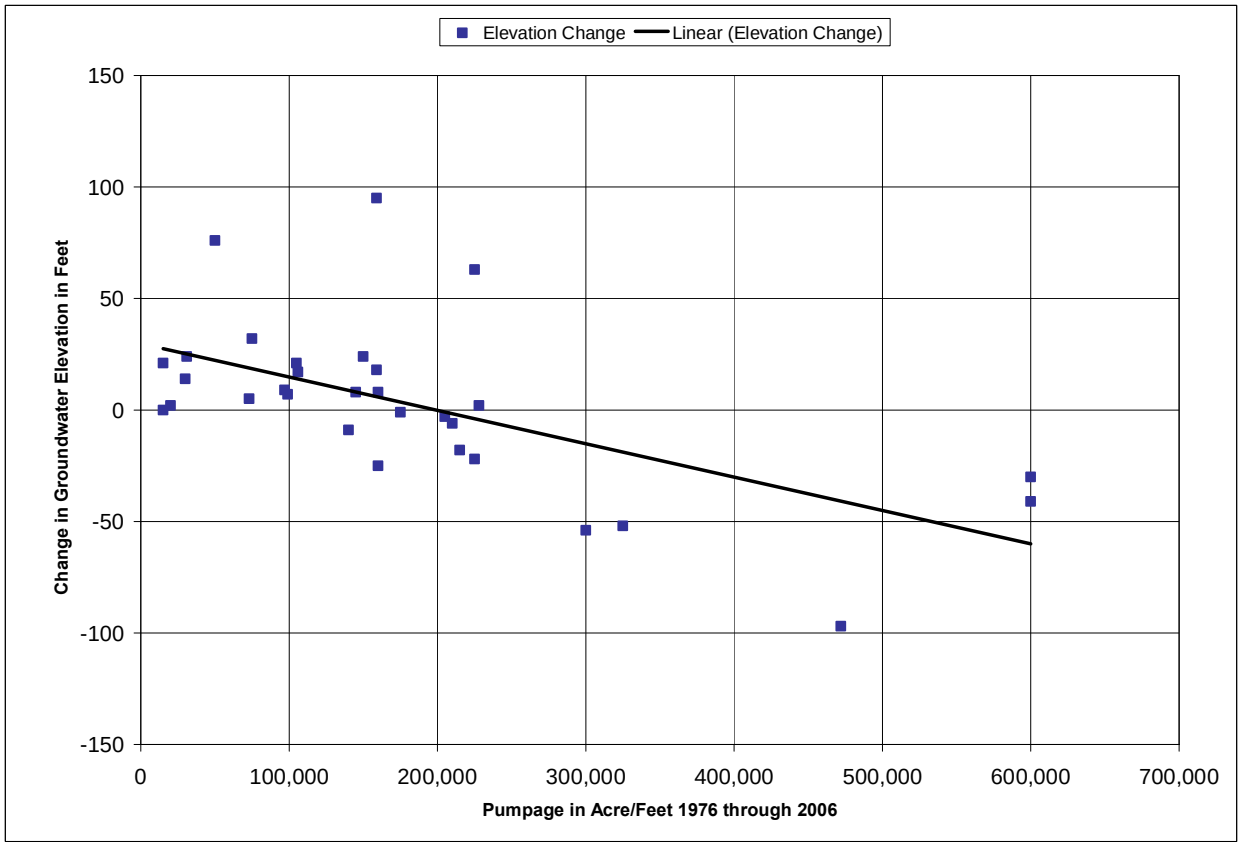


Figure 13: Change in Groundwater Elevation versus Pumping.

Proposed Programs

Westlands Water Districtôs Groundwater Management Plan includes, but is not limited to, the following items. Each item below contains a brief description of past and present District programs and potential future policies and projects.

1. Monitoring and Analysis: The District has monitored groundwater conditions for over 20 years. District staff will continue to monitor and analyze groundwater conditions in Westlands. Water user wells will be monitored each winter to determine static groundwater elevations and salinity monitoring will be performed during the periods of high groundwater pumped to ensure a representative sampling. The data will be analyzed by District staff to determine trends in groundwater elevation and quality. In addition, pumping estimates will be made along with estimates of the change in groundwater storage. In addition, the District will recommend to the landowners and water users that all new wells be equipped with an access tube to accommodate sounding of the well to monitor groundwater elevations.

2. Development and Importation of New Surface Supplies: Westlands will continue to explore opportunities to increase the importation of surface water to stabilize water supplies and reduce the demand for water users to pump groundwater to satisfy their irrigation needs. District staff will seek both short-term and long-term agreements with other agencies which have temporary or sustainable surpluses in water supply. This includes exploring opportunities to negotiate exchange agreements with other agricultural and urban water suppliers in which the District would provide a portion of its allocation during drought years in exchange for a like or greater amount of surface water in normal or wet years.

Finally, Westlands will continue to encourage and facilitate wherever possible the importation of surface water by District water users. The District realizes that in addition to benefiting the individual water user, transfers into the District will reduce the need for groundwater extractions.

3. Restriction in the Exportation of Groundwater: The District will oppose increased levels of groundwater exportation from the District unless the exportation is mitigated by the importation of an equal or greater amount of non-Project water into the District. Those water users who have historically exported pumped groundwater outside the District's boundaries shall within two years of the adoption of this plan, submit an operational plan to the District. This plan shall include the location of the water user's existing wells in Westlands and an estimate of the amount of groundwater which the water user has exported outside the District boundaries from 1986-1995. The water user shall also identify any non-Project surface water supplies which they have imported into the District during that time. Also, the District will oppose any export of surface water from the District which will result in a net increase in the amount of groundwater pumped.

4. Water Conservation: Westlands will continue to have an active water conservation program designed to maximize efficient use of water in the District. District staff will continue to provide District specific information that water users need to effectively manage their irrigations.

This includes providing real-time crop water use information and information on water management techniques such as irrigation scheduling and evaluations. The Districtôs water conservation coordinator will continue to be available to provide water users with technical assistance to meet their irrigation needs.

In addition, the District will continue to maintain its distribution system through preventive maintenance of District pumping facilities, pipelines, and water meters. The District will also maintain a flexible water ordering system to ensure that water users can best manage their water resources.

Westlands implemented the Irrigation System Improvement Program which provided low interest loans to District water users for irrigation system improvements. Funds for this program were provided by the State Water Resources Control Board. This program is intended to reduce the amount of deep percolation losses in the District by increasing irrigation efficiencies. The District will evaluate the Program to determine whether or not to provide funding for additional irrigation system improvements.

5. Water Management Information Program: The District will continue to conduct a program to provide water users with information on groundwater conditions and conservation activities. This information will be contained in the *Irrigator* newsletter through special reports and through water user workshops.

The Districtôs Water Conservation Department developed an Irrigation Handbook in 1985 and continues to distribute copies to new District water users. Water Conservation staff also will continue to make available to District water users an in-house computer with irrigation management software. This software provides water users with an opportunity to explore various irrigation practices and schedules to learn their effects on irrigation efficiency and timing.

In addition, maps and reports on groundwater conditions and trends will continue to be made available to District water users. Workshops will also be conducted periodically to inform District water users on changes in the groundwater conditions and the status of the Groundwater Management Program.

6. Cooperation with Other Agencies: Westlands will work with other state and local agencies to better identify groundwater conditions and to exchange information. Data collected through the District's monitoring efforts will be provided to others so that conditions in the basin and other basins can be tracked. The District will also facilitate studies by agency and university personnel to model groundwater conditions in the basin. District will continue to participate on local and state committees which focus on groundwater conditions, issues, and policies which oversee local groundwater modeling efforts.

In addition, the District will work with other state and local agencies to more precisely identify the location and magnitude of subsidence. To the extent possible, the District will determine if specific actions in addition to those identified in this plan would have positive

impacts on subsidence.

7. Groundwater Meters: The District will recommend to landowners and water users that all groundwater wells extracting groundwater within the District boundaries be equipped with a water meter. The District may develop and implement a program to maintain groundwater meters similar to the program which already exists for the District's surface water meters.

8. Well Construction and Abandonment: The administration of a well construction and well abandonment or destruction program has been delegated to the Counties by the California State Legislature. Fresno and Kings Counties have adopted programs consistent with Department of Water Resources Bulletin 74-81 and administer permit programs to assure proper construction, abandonment, or destruction of groundwater wells within the Counties. The District will continue to support Fresno and Kings Countiesô policies regarding construction and abandonment of groundwater wells. The District will continue to work with these counties to make information on well construction and abandonment policies available to its water users.

9. Conjunctive Use: The District will explore potential conjunctive use projects within and outside of Westlands. This may include identifying possible recharge sites within the District boundaries or purchasing or leasing lands adjacent to the District. Other options may include entering into a long-term arrangement to bank water with another agency or district which would be extracted during times of water shortages.

In addition, the District will continue to operate its Distribution System Integration Program (DIP). This program allows water users to use the District's water distribution system to convey groundwater to other points of use within the District. This program allows for the improved use of groundwater resources.

Westlands will continue to work with local, state, and federal authorities to provide for the long-term use of the San Luis Canal/California Aqueduct to store and transport ground-water pumped from within and outside the District. This program has been authorized on a year-to-year basis in the past by the state as a drought relief measure. As with the DIP program, this program would allow for much greater flexibility in both the timing and location of groundwater use.

RESOLUTION NO. 112-96

WESTLANDS WATER DISTRICT

ADOPTION OF GROUNDWATER MANAGEMENT PLAN

WHEREAS, the Board of Directors adopted a resolution of intent to prepare a groundwater management plan on March 20, 1995; and

WHEREAS, the District has prepared a draft groundwater management plan entitled "Westlands Water District Groundwater Management Plan;" and

WHEREAS, the District has made copies of the plan available to the public and notice of the public hearing on whether to adopt the draft Groundwater Management Plan was given in the manner prescribed by law; and

WHEREAS, all persons desiring to be heard at the public hearing were given the opportunity to present their views to the Board of Directors and any written communications received by the District concerning adoption of the plan were publicly presented at the public hearing; and

WHEREAS, the District has considered all protests to the adoption of the plan and has determined that a majority protest under Section 10753.6 of the Water Code does not exist.

NOW, THEREFORE, BE IT AND IT IS HEREBY RESOLVED by the Board of Directors of Westlands Water District that it is in the best interest of the District to adopt the Groundwater Management Plan pursuant to Part 2.75 (commencing with Section 10750) of Division 6 of the Water Code and that the General Manager is authorized to take all actions reasonably necessary to carry out the intent of Westlands Water District Groundwater Management Plan.

AYES:

NOES:

ABSENT:

ADOPTED:

Appendix F

Planned Annual Budgeted Expenditures for Best Management Practices

Agricultural best management practices are broken down into two categories:

1. Critical Best Management Practices
2. Exemptible Best Management Practices.

The District believes that it is in compliance with all applicable BMPôs. This appendix presents expected typical budget expenditures for the implementation of applicable BMPôs. A single average hourly rate of $30 per hour is utilized as a billable rate for hours expended. The following categories are keyed to the order of presentation in the Plan.

CRITICAL BMPôs:

1. Water Measurement--This BMP covers the maintenance and calibration of the District water measurement devices. All meters in the district are tested and calibrated on a 4-year cycle. Two full time personnel are responsible for calibrating all meters in the district with an annual cost of $200,500. The cost for new metered deliveries is born by the water user requesting new facilities.

2. District Water Pricing Structure--No direct costs are involved.

3. Water Conservation Coordinator--One full time staff water management specialist works in support of the Coordinator to implement the District Water Management Plan. Total time expended annually is equivalent to 1.1 full time personnel, for a cost of $81,370 per year.

4. Water Management Services Support
   a. On-Farm Irrigation and Drainage System Evaluations support is provided in part by the Natural Resources Conservation Service (NRCS) through the EQIP program, which covered 4,317 acres, comprised of 35 fields. Irrigation evaluations will be available from a Mobile Lab operated by the San Luis Delta Mendota Water Authority for the benefit of its members.
   b. Normal Year and Real-Time Irrigation Scheduling and Crop ET Information staff time is provided by District personnel identified under BMP 3, above. Direct costs for mailing the weekly Irrigation Guide are $4,500. Another $1,200 per year is expended to FAX the weekly Irrigation Guide to water users who have FAX machines.
   c. Shallow Groundwater Monitoring information is provided to district water users in the form of maps prepared for April and October each year. Total annual cost to prepare and distribute maps is $2,400.
   d. Water Management Information Program information is undergoing a shift toward being primarily a Web Site based program. Information and publications previously developed as the WMIP will be updated and expanded into this new format.

EXEMPTIBLE BMPôs

1. Distribution System Lining/Piping--All canal lining has been shown to be infeasible and so the District is exempted from this BMP. No costs are budgeted.

2. Line Regulatory Reservoirs-- All reservoir lining has been shown to be infeasible and so the District is exempted from this BMP. No costs are budgeted.

3. Distribution Control--No improvements needed, closed pipeline system. No costs are budgeted.

4. Reuse Systems--No operational spills necessary. No costs are budgeted.

5. Incentive Pricing--The District is in compliance with this BMP. The annual cost of administering the District water transfer program is $30,000 for time equivalent to .5 full time personnel.

6. On-Farm Program Incentives--The low interest improved irrigation system improvement lease program is supported by a State Revolving Fund loan and administrative costs are covered by an additional 1/2% interest rate component. Over the 20 year life of the program is expected that administrative costs will average $5,000 per year.

7. Conjunctive Use--Deep Groundwater Monitoring maps are prepared as part of the Ground Water Management Plan once each year at a cost of $20,000 to cover total staff time of .33 full time personnel.

8. Land Management--The District has purchased 14,000 acres of drainage affected lands within the District and added the water allocation into the water supply available to remaining lands in the District. The purchased lands are retired from irrigated agriculture and either dry farmed or used as wildlife habitat. The annual cost of administering these lands is $100,000 for time equivalent to .25 full time personnel. This program is over and above any USBR land retirement programs.

9. Pump Efficiency Testing--Pump testing is an integral part of the District pump maintenance program. In 2006, the District tested 106 pumps. These tests were used to schedule maintenance on which and when pumps should be rebuilt based on efficiency. Based on these tests 35 pumps were overhauled in 2006 at a cost of $271,162 in parts and labor.

Total District budgeted expenditures are expected to remain stable at current levels for the scope of this Water Management Plan but are dependent on the yearly contract water supply that has been severely affected by regulatory actions that have reduced the reliability in recent years. Total budgeted District expenditures for the efforts previously discussed are $543,900 per year in staff time, supplies and costs for 2006. 3% per year

inflation is projected for the next 3 years.

The following table summarizes current and projected budgeted expenditures for the next 3 years:

CRITICAL BMP's	2006	2007	2008	2009
1. Water Measurement	$229,000	$200,500	$206,100	$212,300
2. District Water Pricing Structure				
3. Water Conservation Coordinator	$81,370	$83,000	$85,075	$87,201
4. Water Management Services Support	$40,000	$40,000	$40,000	$40,000
EXEMPTIBLE BMP'				
1. Distribution System Lining/Piping				
2. Line Regulatory Reservoirs				
3. Distribution Control				
4. Reuse Systems				
5. Incentive Pricing	$30,000	$30,900	$31,827	$32,782
6. On-Farm Program Incentives	$5,000	$5,150	$5,305	$5,464
7. Conjunctive Use	$29,000	$29,870	$30,766	$31,689
8. Land Management	$300,000	$300,000	$300,000	$300,000
9. Pump Efficiency Testing	$271,262	$300,000	$307,500	$315,200
Annual Total	$985,632	$989,420	$1,006,573	$1,024,636

Appendix G

RESOLUTION NO. 104-09

RESOLUTION NO. 104-09

WESTLANDS WATER DISTRICT

A RESOLUTION OF THE BOARD OF DIRECTORS ADOPTING THE WESTLANDS WATER DISTRICT WATER MANAGEMENT PLAN FOR THE PURPOSE OF COMPYING WITH WATER CONSERVATION PROVISIONS OF THE WATER SERVICE CONTRACT BETWEEN WESTLANDS WATER DISTRICT AND THE UNITED STATES

WHEREAS, Section 210 of the Reclamation Reform Act of 1982 (Public Law 97-293; 43 US § 390jj) requires districts with repayment or water supply contracts to develop and maintain water conservation plans containing definite goals, appropriate water conservation measures, and time schedules for meeting conservation objectives; and

WHEREAS, Section No. 3405(e) of the Central Valley Project Improvement Act of 1992 (Title XXXIV, Public Law 102-575, 106 Stat. 4713) requires the Secretary of the Interior to establish an office to develop criteria for evaluating water conservation plans developed by CVP contractors, and that said plans be updated every five years; and

WHEREAS, Westlands Water District has a federal water service contract and has, therefore, prepared a Water Conservation Plan; and

WHEREAS, Westlands Water District's Board of Directors adopted Westlands' 1999 Water Conservation Plan with the 2002 Supplemental M&I Urban Plan in May 2002; and

WHEREAS, Westlands Water District has prepared a 2007 Water Management Plan in accordance with the law, which updates the District's Water Conservation Plan and which satisfies the criteria for evaluation of water conservation plans developed by the U.S. Bureau of Reclamation; and

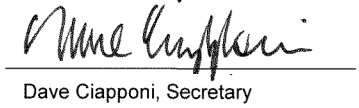
NOW, THEREFORE, BE IT AND IT IS HEREBY RESOLVED that the 2007 Water Management Plan is adopted.

Adopted at a regular meeting of the Board of Directors at Fresno, California, this 20th day of January, 2009.

AYES: Directors Coelho, Devine, Diener, Errotabere, Esajian, Enos, Sagouspe, Sheely and Peracchi

NOES: None

ABSENT: None



Dave Ciapponi, Secretary